

SEQUENCE LISTING

<110> Mohnen, Debra
Sterling, Jason D.
Doong, Ron L.
Kolli, Venkata S.K.
Hahn, Michael G.

<120> Galacturonosyltransferases, nucleic acids encoding same, and uses therefor

<130> 14-03 US

<140> Not assigned yet

<141> 2005-08-02

<150> PCT/US2004/003545

<151> 2004-02-05

<150> US 60/445,539

<151> 2003-02-06

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<170> PatentIn version 3.2

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Tyr Gly Ser Tyr Cys Leu Trp Arg Glu Glu Asn Lys Glu Pro Met Lys
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Ser Arg Arg Leu Asp Gln Leu Ser Ala Arg Val Leu Ser Ala Thr Asp
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<213> Arabidospsis thaliana

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Ser Ile Thr Pro Val Gly Arg Arg Glu Phe Ile Glu Glu Leu Ser Lys
35 40 45

Ile Arg Phe Thr Thr Asn Asp Leu Arg Leu Ser Ala Ile Glu His Glu
50 55 60

Asp Gly Glu Gly Leu Lys Gly Pro Arg Leu Ile Leu Phe Lys Asp Gly
65 70 75 80

Glu Phe Asn Ser Ser Ala Glu Ser Asp Gly Gly Asn Thr Tyr Lys Asn
85 90 95

Arg Glu Glu Gln Val Ile Val Ser Gln Lys Met Thr Val Ser Ser Asp
100 105 110

Glu Lys Gly Gln Ile Leu Pro Thr Val Asn Gln Leu Ala Asn Lys Thr
115 120 125

Asp Phe Lys Pro Pro Leu Ser Lys Gly Glu Lys Asn Thr Arg Val Gln
130 135 140

Pro Asp Arg Ala Thr Asp Val Lys Thr Lys Glu Ile Arg Asp Lys Ile
145 150 155 160

Ile Gln Ala Lys Ala Tyr Leu Asn Phe Ala Pro Pro Gly Ser Asn Ser
 165 170 175

Gln Val Val Lys Glu Leu Arg Gly Arg Leu Lys Glu Leu Glu Arg Ser
 180 185 190

Val Gly Asp Ala Thr Lys Asp Lys Asp Leu Ser Lys Gly Ala Leu Arg
 195 200 205

Arg Val Lys Pro Met Glu Asn Val Leu Tyr Lys Ala Ser Arg Val Phe
 210 215 220

Asn Asn Cys Pro Ala Ile Ala Thr Lys Leu Arg Ala Met Asn Tyr Asn
 225 230 235 240

Thr Glu Glu Gln Val Gln Ala Gln Lys Asn Gln Ala Ala Tyr Leu Met
 245 250 255

Gln Leu Ala Ala Arg Thr Thr Pro Lys Gly Leu His Cys Leu Ser Met
 260 265 270

Arg Leu Thr Ser Glu Tyr Phe Ser Leu Asp Pro Glu Lys Arg Gln Met
 275 280 285

Pro Asn Gln Gln Asn Tyr Phe Asp Ala Asn Phe Asn His Tyr Val Val
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Phe Ser Asp Asn Val Leu Ala Ser Ser Val Val Val Asn Ser Thr Ile
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Ser Ser Ser Lys Glu Pro Glu Arg Ile Val Phe His Val Val Thr Asp
 325 330 335

Ser Leu Asn Tyr Pro Ala Ile Ser Met Trp Phe Leu Leu Asn Ile Gln
 340 345 350

Ser Lys Ala Thr Ile Gln Ile Leu Asn Ile Asp Asp Met Asp Val Leu
 355 360 365

Pro Arg Asp Tyr Asp Gln Leu Leu Met Lys Gln Asn Ser Asn Asp Pro
 370 375 380

Arg Phe Ile Ser Thr Leu Asn His Ala Arg Phe Tyr Leu Pro Asp Ile
 385 390 395 400

Phe Pro Gly Leu Asn Lys Met Val Leu Leu Asp His Asp Val Val Val
405 410 415

Gln Arg Asp Leu Ser Arg Leu Trp Ser Ile Asp Met Lys Gly Lys Val
420 425 430

Val Gly Ala Val Glu Thr Cys Leu Glu Gly Glu Ser Ser Phe Arg Ser
435 440 445

Met Ser Thr Phe Ile Asn Phe Ser Asp Thr Trp Val Ala Gly Lys Phe
450 455 460

Ser Pro Arg Ala Cys Thr Trp Ala Phe Gly Met Asn Leu Ile Asp Leu
465 470 475 480

Glu Glu Trp Arg Ile Arg Lys Leu Thr Ser Thr Tyr Ile Lys Tyr Phe
485 490 495

Asn Leu Gly Thr Lys Arg Pro Leu Trp Lys Ala Gly Ser Leu Pro Ile
500 505 510

Gly Trp Leu Thr Phe Tyr Arg Gln Thr Leu Ala Leu Asp Lys Arg Trp
515 520 525

His Val Met Gly Leu Gly Arg Glu Ser Gly Val Lys Ala Val Asp Ile
530 535 540

Glu Gln Ala Ala Val Ile His Tyr Asp Gly Val Met Lys Pro Trp Leu
545 550 555 560

Asp Ile Gly Lys Glu Asn Tyr Lys Arg Tyr Trp Asn Ile His Val Pro
565 570 575

Tyr His His Thr Tyr Leu Gln Gln Cys Asn Leu Gln Ala
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<210> 9

<211> 1614

<212> DNA

<213> Arabidopsis thaliana

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tctcctcccc atttaaactt cacggaagag gtcacaagtg cttcctcctt ctctaggcag 240

Val Leu Phe Ile Val Gln His Tyr His His Gln Gln Asp Pro Ser Gln
 35 40 45

Leu Leu Leu Glu Arg Asp Thr Arg Thr Glu Met Val Ser Pro Pro His
 50 55 60

Leu Asn Phe Thr Glu Glu Val Thr Ser Ala Ser Ser Phe Ser Arg Gln
 65 70 75 80

Leu Ala Glu Gln Met Thr Leu Ala Lys Ala Tyr Val Phe Ile Ala Lys
 85 90 95

Glu His Asn Asn Leu His Leu Ala Trp Glu Leu Ser Ser Lys Ile Arg
 100 105 110

Ser Cys Gln Leu Leu Leu Ser Lys Ala Ala Met Arg Gly Gln Pro Ile
 115 120 125

Ser Phe Asp Glu Ala Lys Pro Ile Ile Thr Gly Leu Ser Ala Leu Ile
 130 135 140

Tyr Lys Ala Gln Asp Ala His Tyr Asp Ile Ala Thr Thr Met Met Thr
 145 150 155 160

Met Lys Ser His Ile Gln Ala Leu Glu Glu Arg Ala Asn Ala Ala Thr
 165 170 175

Val Gln Thr Thr Ile Phe Gly Gln Leu Val Ala Glu Ala Leu Pro Lys
 180 185 190

Ser Leu His Cys Leu Thr Ile Lys Leu Thr Ser Asp Trp Val Thr Glu
 195 200 205

Pro Ser Arg His Glu Leu Ala Asp Glu Asn Arg Asn Ser Pro Arg Leu
 210 215 220

Val Asp Asn Asn Leu Tyr His Phe Cys Ile Phe Ser Asp Asn Val Ile
 225 230 235 240

Ala Thr Ser Val Val Val Asn Ser Thr Val Ser Asn Ala Asp His Pro
 245 250 255

Lys Gln Leu Val Phe His Ile Val Thr Asn Arg Val Ser Tyr Lys Ala
 260 265 270

Met Gln Ala Trp Phe Leu Ser Asn Asp Phe Lys Gly Ser Ala Ile Glu

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 <211> 537
 <212> PRT
 <213> *Arabidopsis thaliana*

<400> 10

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275					280					285					
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	290					295					300				
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Lys	Tyr	Leu	Ser	Leu	Leu	Asn	His	Leu	Arg	Phe	Tyr	Ile	Pro	Glu	Ile
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Arg	Asn	Ala	Asn	Val	Thr	Ala	Arg	Tyr	His	Tyr	Trp	Gln	Asp	Gln	Asn
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	450					455					460				
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Gly	Leu	Gly	Tyr	Asp	Val	Asn	Ile	Asp	Asn	Arg	Leu	Ile	Glu	Thr	Ala
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Ala	Val	Ile	His	Tyr	Asn	Gly	Asn	Met	Lys	Pro	Trp	Leu	Lys	Leu	Ala
			500					505					510		
Ile	Gly	Arg	Tyr	Lys	Pro	Phe	Trp	Leu	Lys	Phe	Leu	Asn	Ser	Ser	His
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<212> DNA
<213> Arabidopsis thaliana

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 <212> PRT
 <213> Arabidopsis thaliana

<400> 12

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Phe Phe Leu Ile Leu Ser Lys Ala Gly His Ile Glu Pro Arg Pro Ser
 35 40 45

Ile Pro Lys Arg Arg Tyr Arg Asn Asp Lys Phe Val Glu Gly Met Asn
 50 55 60

Met Thr Glu Glu Met Leu Ser Pro Thr Ser Val Ala Arg Gln Val Asn
 65 70 75 80

Asp Gln Ile Ala Leu Ala Lys Ala Phe Val Val Ile Ala Lys Glu Ser
 85 90 95

Lys Asn Leu Gln Phe Ala Trp Asp Leu Ser Ala Gln Ile Arg Asn Ser
 100 105 110

Gln Leu Leu Leu Ser Ser Ala Ala Thr Arg Arg Ser Pro Leu Thr Val
 115 120 125

Leu Glu Ser Glu Ser Thr Ile Arg Asp Met Ala Val Leu Leu Tyr Gln
 130 135 140

Ala Gln Gln Leu His Tyr Asp Ser Ala Thr Met Ile Met Arg Leu Lys
 145 150 155 160

Ala Ser Ile Gln Ala Leu Glu Glu Gln Met Ser Ser Val Ser Glu Lys
 165 170 175

Ser Ser Lys Tyr Gly Gln Ile Ala Ala Glu Glu Val Pro Lys Ser Leu
 180 185 190

Tyr Cys Leu Gly Val Arg Leu Thr Thr Glu Trp Phe Gln Asn Leu Asp
 195 200 205

Leu Gln Arg Thr Leu Lys Glu Arg Ser Arg Val Asp Ser Lys Leu Thr
 210 215 220

Asp Asn Ser Leu Tyr His Phe Cys Val Phe Ser Asp Asn Ile Ile Ala
 225 230 235 240

Thr Ser Val Val Val Asn Ser Thr Ala Leu Asn Ser Lys Ala Pro Glu
 245 250 255

Lys Val Val Phe His Leu Val Thr Asn Glu Ile Asn Tyr Ala Ala Met
 260 265 270

Lys Ala Trp Phe Ala Ile Asn Met Asp Asn Leu Arg Gly Val Thr Val
 275 280 285

Glu Val Gln Lys Phe Glu Asp Phe Ser Trp Leu Asn Ala Ser Tyr Val
 290 295 300

Pro Val Leu Lys Gln Leu Gln Asp Ser Asp Thr Gln Ser Tyr Tyr Phe
 305 310 315 320

Ser Gly His Asn Asp Asp Gly Arg Thr Pro Ile Lys Phe Arg Asn Pro
 325 330 335

Lys Tyr Leu Ser Met Leu Asn His Leu Arg Phe Tyr Ile Pro Glu Val
 340 345 350

Phe Pro Ala Leu Lys Lys Val Val Phe Leu Asp Asp Asp Val Val Val
 355 360 365

Gln Lys Asp Leu Ser Ser Leu Phe Ser Ile Asp Leu Asn Lys Asn Val
 370 375 380

Asn Gly Ala Val Glu Thr Cys Met Glu Thr Phe His Arg Tyr His Lys

Tyr Leu Asn Tyr Ser His Pro Leu Ile Arg Ser His Phe Asp Pro Asp
 405 410 415

Ala Cys Gly Trp Ala Phe Gly Met Asn Val Phe Asp Leu Val Glu Trp
 420 425 430

Arg Lys Arg Asn Val Thr Gly Ile Tyr His Tyr Trp Gln Glu Lys Asn
 435 440 445

Val Asp Arg Thr Leu Trp Lys Leu Gly Thr Leu Pro Pro Gly Leu Leu
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Thr Phe Tyr Gly Leu Thr Glu Ala Leu Glu Ala Ser Trp His Ile Leu
 465 470 475 480

Gly Leu Gly Tyr Thr Asn Val Asp Ala Arg Val Ile Glu Lys Gly Ala
 485 490 495

Val Leu His Phe Asn Gly Asn Leu Lys Pro Trp Leu Lys Ile Gly Ile
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Glu Lys Tyr Lys Pro Leu Trp Glu Arg Tyr Val Asp Tyr Thr Ser Pro
 515 520 525

Phe Met Gln Gln Cys Asn Phe His
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 <211> 1833
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 <213> Arabidopsis thaliana

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 gcagcaagga ctaccccaaa agggcttcat tgtctctcaa tgcggttgac aacagaatat 900

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<210> 14
<211> 610
<212> PRT
<213> Arabidopsis thaliana

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<400> 14

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Leu Leu Ser Val Leu Ala Pro Ile Val Phe Val Ser Asn Arg Leu Lys
20          25          30

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Ser Ile Thr Ser Val Asp Arg Gly Glu Phe Ile Glu Glu Leu Ser Asp
35          40          45

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Ile Thr Asp Lys Thr Glu Asp Glu Leu Arg Leu Thr Ala Ile Glu Gln
50          55          60

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Asp Glu Glu Gly Leu Lys Glu Pro Lys Arg Ile Leu Gln Asp Arg Asp
65          70          75          80

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Phe Asn Ser Val Val Leu Ser Asn Ser Ser Asp Lys Ser Asn Asp Thr

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85

90

95

Val Gln Ser Asn Glu Gly Asp Gln Lys Asn Phe Leu Ser Glu Val Asp
 100 105 110

Lys Gly Asn Asn His Lys Pro Lys Glu Glu Gln Ala Val Ser Gln Lys
 115 120 125

Thr Thr Val Ser Ser Asn Ala Glu Val Lys Ile Ser Ala Arg Asp Ile
 130 135 140

Gln Leu Asn His Lys Thr Glu Phe Arg Pro Pro Ser Ser Lys Ser Glu
 145 150 155 160

Lys Asn Thr Arg Val Gln Leu Glu Arg Ala Thr Asp Glu Arg Val Lys
 165 170 175

Glu Ile Arg Asp Lys Ile Ile Gln Ala Lys Ala Tyr Leu Asn Leu Ala
 180 185 190

Leu Pro Gly Asn Asn Ser Gln Ile Val Lys Glu Leu Arg Val Arg Thr
 195 200 205

Lys Glu Leu Glu Arg Ala Thr Gly Asp Thr Thr Lys Asp Lys Tyr Leu
 210 215 220

Pro Lys Ser Ser Pro Asn Arg Leu Lys Ala Met Glu Val Ala Leu Tyr
 225 230 235 240

Lys Val Ser Arg Ala Phe His Asn Cys Pro Ala Ile Ala Thr Lys Leu
 245 250 255

Gln Ala Met Thr Tyr Lys Thr Glu Glu Gln Ala Arg Ala Gln Lys Lys
 260 265 270

Gln Ala Ala Tyr Leu Met Gln Leu Ala Ala Arg Thr Thr Pro Lys Gly
 275 280 285

Leu His Cys Leu Ser Met Arg Leu Thr Thr Glu Tyr Phe Thr Leu Asp
 290 295 300

His Glu Lys Arg Gln Leu Leu Gln Gln Ser Tyr Asn Asp Pro Asp Leu
 305 310 315 320

Tyr His Tyr Val Val Phe Ser Asp Asn Val Leu Ala Ser Ser Val Val
 325 330 335

Val Asn Ser Thr Ile Ser Ser Ser Lys Glu Pro Asp Lys Ile Val Phe
340 345 350

His Val Val Thr Asp Ser Leu Asn Tyr Pro Ala Ile Ser Met Trp Phe
355 360 365

Leu Leu Asn Pro Ser Gly Arg Ala Ser Ile Gln Ile Leu Asn Ile Asp
370 375 380

Glu Met Asn Val Leu Pro Leu Tyr His Ala Glu Leu Leu Met Lys Gln
385 390 395 400

Asn Ser Ser Asp Pro Arg Ile Ile Ser Ala Leu Asn His Ala Arg Phe
405 410 415

Tyr Leu Pro Asp Ile Phe Pro Gly Leu Asn Lys Ile Val Leu Phe Asp
420 425 430

His Asp Val Val Val Gln Arg Asp Leu Thr Arg Leu Trp Ser Leu Asp
435 440 445

Met Thr Gly Lys Val Val Gly Ala Val Glu Thr Cys Leu Glu Gly Asp
450 455 460

Pro Ser Tyr Arg Ser Met Asp Ser Phe Ile Asn Phe Ser Asp Ala Trp
465 470 475 480

Val Ser Gln Lys Phe Asp Pro Lys Ala Cys Thr Trp Ala Phe Gly Met
485 490 495

Asn Leu Phe Asp Leu Glu Glu Trp Arg Arg Gln Glu Leu Thr Ser Val
500 505 510

Tyr Leu Lys Tyr Phe Asp Leu Gly Val Lys Gly His Leu Trp Lys Ala
515 520 525

Gly Gly Leu Pro Val Gly Trp Leu Thr Phe Phe Gly Gln Thr Phe Pro
530 535 540

Leu Glu Lys Arg Trp Asn Val Gly Gly Leu Gly His Glu Ser Gly Leu
545 550 555 560

Arg Ala Ser Asp Ile Glu Gln Ala Ala Val Ile His Tyr Asp Gly Ile
565 570 575

Met Lys Pro Trp Leu Asp Ile Gly Ile Asp Lys Tyr Lys Arg Tyr Trp
580 585 590

Asn Ile His Val Pro Tyr His His Pro His Leu Gln Arg Cys Asn Ile
595 600 605

His Asp
610

<210> 15
<211> 1587
<212> DNA
<213> Arabidopsis thaliana

<400> 15
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accatttgga aaaatgaata ccggaggggc aagagttttg aagatatggt acgtttgatg 300
caagatcaaa tcatcatggc acgagtttac agtggacttg caaagtttac aaacaatctc 360
gccttgacc aagagataga aacacaacta atgaaactag cttgggagga agaactctact 420
gatattgatc aggagcagag agtacttgac agtataagag acatgggaca aatactggct 480
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caaacagttg aagatgaact cgaaaacgag cagacttata taacgttctt gactcagcta 600
gcttccaagg cactaccaga tgctatccac tgcttgacca tgcgcttgaa tctagagtat 660
catctcctgc ctttaccgat gagaaatttt ccaaggaggg agaatttgga gaatccaaaa 720
ctttaccact acgctctctt ctctgataat gtactggctg catcagttgt tgtcaactcc 780
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 atctttactt gcaggctggtt tgagtga 1587

<210> 16
 <211> 528
 <212> PRT
 <213> Arabidopsis thaliana

<400> 16

Met Thr Asp Ala Cys Cys Leu Lys Gly Asn Glu Asp Lys Met Val Pro
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Arg Phe Gly His Gly Thr Trp Ile Gly Lys Ala Phe Asn Asp Thr Pro
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Glu Met Leu His Glu Arg Ser Leu Arg Gln Glu Lys Arg Leu Glu Arg
 35 40 45

Ala Asn Glu Leu Met Asn Asp Asp Ser Leu Gln Lys Leu Glu Thr Ala
 50 55 60

Ala Met Ala Arg Ser Arg Ser Val Asp Ser Ala Pro Leu Gly Asn Tyr
 65 70 75 80

Thr Ile Trp Lys Asn Glu Tyr Arg Arg Gly Lys Ser Phe Glu Asp Met
 85 90 95

Leu Arg Leu Met Gln Asp Gln Ile Ile Met Ala Arg Val Tyr Ser Gly
 100 105 110

Leu Ala Lys Phe Thr Asn Asn Leu Ala Leu His Gln Glu Ile Glu Thr
 115 120 125

Gln Leu Met Lys Leu Ala Trp Glu Glu Glu Ser Thr Asp Ile Asp Gln
 130 135 140

Glu Gln Arg Val Leu Asp Ser Ile Arg Asp Met Gly Gln Ile Leu Ala
 145 150 155 160

Arg Ala His Glu Gln Leu Tyr Glu Cys Lys Leu Val Thr Asn Lys Leu
 165 170 175

Arg Ala Met Leu Gln Thr Val Glu Asp Glu Leu Glu Asn Glu Gln Thr
 180 185 190

Tyr Ile Thr Phe Leu Thr Gln Leu Ala Ser Lys Ala Leu Pro Asp Ala
 195 200 205

Ile His Cys Leu Thr Met Arg Leu Asn Leu Glu Tyr His Leu Leu Pro
 210 215 220

Leu Pro Met Arg Asn Phe Pro Arg Arg Glu Asn Leu Glu Asn Pro Lys
 225 230 235 240

Leu Tyr His Tyr Ala Leu Phe Ser Asp Asn Val Leu Ala Ala Ser Val
 245 250 255

Val Val Asn Ser Thr Val Met Asn Ala Gln Asp Pro Ser Arg His Val
 260 265 270

Phe His Leu Val Thr Asp Lys Leu Asn Phe Gly Ala Met Ser Met Trp
 275 280 285

Phe Leu Leu Asn Pro Pro Gly Glu Ala Thr Ile His Val Gln Arg Phe
 290 295 300

Glu Asp Phe Thr Trp Leu Asn Ser Ser Tyr Ser Pro Val Leu Ser Gln
 305 310 315 320

Leu Glu Ser Ala Ala Met Lys Lys Phe Tyr Phe Lys Thr Ala Arg Ser
 325 330 335

Glu Ser Val Glu Ser Gly Ser Glu Asn Leu Lys Tyr Arg Tyr Pro Lys
 340 345 350

Tyr Met Ser Met Leu Asn His Leu Arg Phe Tyr Ile Pro Arg Ile Phe
 355 360 365

Pro Lys Leu Glu Lys Ile Leu Phe Val Asp Asp Asp Val Val Val Gln
 370 375 380

Lys Asp Leu Thr Pro Leu Trp Ser Ile Asp Leu Lys Gly Lys Val Asn
 385 390 395 400

Glu Asn Phe Asp Pro Lys Phe Cys Gly Trp Ala Tyr Gly Met Asn Ile
 405 410 415

Phe Asp Leu Lys Glu Trp Lys Lys Asn Asn Ile Thr Glu Thr Tyr His
420 425 430

Phe Trp Gln Asn Leu Asn Glu Asn Arg Thr Leu Trp Lys Leu Gly Thr
435 440 445

Leu Pro Pro Gly Leu Ile Thr Phe Tyr Asn Leu Thr Gln Pro Leu Gln
450 455 460

Arg Lys Trp His Leu Leu Gly Leu Gly Tyr Asp Lys Gly Ile Asp Val
465 470 475 480

Lys Lys Ile Glu Arg Ser Ala Val Ile His Tyr Asn Gly His Met Lys
485 490 495

Pro Trp Thr Glu Met Gly Ile Ser Lys Tyr Gln Pro Tyr Trp Thr Lys
500 505 510

Tyr Thr Asn Phe Asp His Pro Tyr Ile Phe Thr Cys Arg Leu Phe Glu
515 520 525

<210> 17
<211> 1602
<212> DNA
<213> Arabidopsis thaliana

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cttgaaggtg tcaacaagtg ctctcttttt gattgtttcg ggaggcggct aggaccacgt 240
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aatgaagtaa gcactcaaga aattccagat ggtttaaagc ttccagagtc ttttagtcaa 360
ctggtttcgg atatgaagaa caaccactat gatgctaaaa catttgccct cgtatttcga 420
gctatggtag agaagtttga aagggtttta agggaaatcca aatttgcaga actcatgaac 480
aagcactttg ctgcaagttc aattccaaaa ggaattcact gtctctcttt aagactaacc 540
gatgaatatt cctccaatgc tcatgcccgg agacagcttc cttccccgga gcttctccct 600
gttctctcag acaatgctta ccaccatttt gttctagcta cagataatat cttagctgca 660
tcggttggtg tctcatctgc tgttcaatca tcttcaaaac ccgagaaaat tgtcttccat 720
gttatcacag acaagaaaac ctatgcgggt atgcattctt ggtttgact caattctggt 780

gctcctgcga ttgttgaagt gaaaagcgtt catcagtttg attggttaac aagagagaat 840
gttccagttc ttgaagctgt ggaaagccat aacagtatca gaaattatta ccatgggaat 900
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agcaagacca acttagaaaa tgcgaagaaa gctgcagtga ttcattacaa tggccaatca 1500
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tactccaatg atttcattaa gaattgtcat atcttggaaat ag 1602

<210> 18
<211> 533
<212> PRT
<213> Arabidopsis thaliana

<400> 18

Met Gln Leu His Ile Ser Pro Ser Met Arg Ser Ile Thr Ile Ser Ser
1 5 10 15

Ser Asn Glu Phe Ile Asp Leu Met Lys Ile Lys Val Ala Ala Arg His
20 25 30

Ile Ser Tyr Arg Thr Leu Phe His Thr Ile Leu Ile Leu Ala Phe Leu
35 40 45

Leu Pro Phe Val Phe Ile Leu Thr Ala Val Val Thr Leu Glu Gly Val
50 55 60

Asn Lys Cys Ser Ser Phe Asp Cys Phe Gly Arg Arg Leu Gly Pro Arg
65 70 75 80

Leu Leu Gly Arg Ile Asp Asp Ser Glu Gln Arg Leu Val Arg Asp Phe
85 90 95

Tyr Lys Ile Leu Asn Glu Val Ser Thr Gln Glu Ile Pro Asp Gly Leu
100 105 110

Lys Leu Pro Glu Ser Phe Ser Gln Leu Val Ser Asp Met Lys Asn Asn
 115 120 125

His Tyr Asp Ala Lys Thr Phe Ala Leu Val Phe Arg Ala Met Val Glu
 130 135 140

Lys Phe Glu Arg Asp Leu Arg Glu Ser Lys Phe Ala Glu Leu Met Asn
 145 150 155 160

Lys His Phe Ala Ala Ser Ser Ile Pro Lys Gly Ile His Cys Leu Ser
 165 170 175

Leu Arg Leu Thr Asp Glu Tyr Ser Ser Asn Ala His Ala Arg Arg Gln
 180 185 190

Leu Pro Ser Pro Glu Leu Leu Pro Val Leu Ser Asp Asn Ala Tyr His
 195 200 205

His Phe Val Leu Ala Thr Asp Asn Ile Leu Ala Ala Ser Val Val Val
 210 215 220

Ser Ser Ala Val Gln Ser Ser Ser Lys Pro Glu Lys Ile Val Phe His
 225 230 235 240

Val Ile Thr Asp Lys Lys Thr Tyr Ala Gly Met His Ser Trp Phe Ala
 245 250 255

Leu Asn Ser Val Ala Pro Ala Ile Val Glu Val Lys Ser Val His Gln
 260 265 270

Phe Asp Trp Leu Thr Arg Glu Asn Val Pro Val Leu Glu Ala Val Glu
 275 280 285

Ser His Asn Ser Ile Arg Asn Tyr Tyr His Gly Asn His Ile Ala Gly
 290 295 300

Ala Asn Leu Ser Glu Thr Thr Pro Arg Thr Phe Ala Ser Lys Leu Gln
 305 310 315 320

Ser Arg Ser Pro Lys Tyr Ile Ser Leu Leu Asn His Leu Arg Ile Tyr
 325 330 335

Leu Pro Glu Leu Phe Pro Asn Leu Asp Lys Val Val Phe Leu Asp Asp
 340 345 350

Asp Ile Val Ile Gln Lys Asp Leu Ser Pro Leu Trp Asp Ile Asp Leu
 355 360 365

Asn Gly Lys Val Asn Gly Ala Val Glu Thr Cys Arg Gly Glu Asp Val
 370 375 380

Trp Val Met Ser Lys Arg Leu Arg Asn Tyr Phe Asn Phe Ser His Pro
 385 390 395 400

Leu Ile Ala Lys His Leu Asp Pro Glu Glu Cys Ala Trp Ala Tyr Gly
 405 410 415

Met Asn Ile Phe Asp Leu Arg Thr Trp Arg Lys Thr Asn Ile Arg Glu
 420 425 430

Thr Tyr His Ser Trp Leu Lys Glu Asn Leu Lys Ser Asn Leu Thr Met
 435 440 445

Trp Lys Leu Gly Thr Leu Pro Pro Ala Leu Ile Ala Phe Lys Gly His
 450 455 460

Val Gln Pro Ile Asp Ser Ser Trp His Met Leu Gly Leu Gly Tyr Gln
 465 470 475 480

Ser Lys Thr Asn Leu Glu Asn Ala Lys Lys Ala Ala Val Ile His Tyr
 485 490 495

Asn Gly Gln Ser Lys Pro Trp Leu Glu Ile Gly Phe Glu His Leu Arg
 500 505 510

Pro Phe Trp Thr Lys Tyr Val Asn Tyr Ser Asn Asp Phe Ile Lys Asn
 515 520 525

Cys His Ile Leu Glu
 530

<210> 19
 <211> 1686
 <212> DNA
 <213> Arabidopsis thaliana

<400> 19
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agtatgggca acgcatatat gcagaggacg tttttggcctt tgcaatcgga tccattgaaa	240
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gctgcttacg ctaggaagct aaagcttgat gcttctaagc agcttaagct cttcgaagat	360
ttggctatca acttctcgga tttgcagtcg aaacctgggt tgaaatctgc tgtgtctgat	420
aatggtaatg ctcttgagga ggattcggtt aggcagcttg agaaagaagt gaaggataag	480
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aacggtgcgg ttgctagctt gatttcagcc aagtcggttc ctaaaagtct tcattgtttg	660
gccatgaggc ttgtaggaga gaggatctct aatcctgaga agtacaagga tgctccacct	720
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cctttggacc gtggtgcca tgttgagatt aaatccgtgg aggatttcaa gttcttaaac	960
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gtgattcatt acaatggaaa catgaaaccg tggctagaca ttgcgatgaa ccaatacaag	1620
tctctctgga ctaaatatgt tgataacgaa atggagtttg tgcagatgtg caattttggt	1680
ctctaa	1686

<210> 20
 <211> 561
 <212> PRT
 <213> Arabidopsis thaliana

<400> 20

Met Ala Val Ala Phe Arg Gly Gly Arg Gly Gly Val Gly Ser Gly Gln

Asp Asn Val Ile Ala Val Ser Val Val Val Arg Ser Val Val Met Asn
 260 265 270

Ala Glu Glu Pro Trp Lys His Val Phe His Val Val Thr Asp Arg Met
 275 280 285

Asn Leu Ala Ala Met Lys Val Trp Phe Lys Met Arg Pro Leu Asp Arg
 290 295 300

Gly Ala His Val Glu Ile Lys Ser Val Glu Asp Phe Lys Phe Leu Asn
 305 310 315 320

Ser Ser Tyr Ala Pro Val Leu Arg Gln Leu Glu Ser Ala Lys Leu Gln
 325 330 335

Lys Phe Tyr Phe Glu Asn Gln Ala Glu Asn Ala Thr Lys Asp Ser His
 340 345 350

Asn Leu Lys Phe Lys Asn Pro Lys Tyr Leu Ser Met Leu Asn His Leu
 355 360 365

Arg Phe Tyr Leu Pro Glu Met Tyr Pro Lys Leu Asn Lys Ile Leu Phe
 370 375 380

Leu Asp Asp Asp Val Val Val Gln Lys Asp Val Thr Gly Leu Trp Lys
 385 390 395 400

Ile Asn Leu Asp Gly Lys Val Asn Gly Ala Val Glu Thr Cys Phe Gly
 405 410 415

Ser Phe His Arg Tyr Gly Gln Tyr Leu Asn Phe Ser His Pro Leu Ile
 420 425 430

Lys Glu Asn Phe Asn Pro Ser Ala Cys Ala Trp Ala Phe Gly Met Asn
 435 440 445

Ile Phe Asp Leu Asn Ala Trp Arg Arg Glu Lys Cys Thr Asp Gln Tyr
 450 455 460

His Tyr Trp Gln Asn Leu Asn Glu Asp Arg Thr Leu Trp Lys Leu Gly
 465 470 475 480

Thr Leu Pro Pro Gly Leu Ile Thr Phe Tyr Ser Lys Thr Lys Ser Leu
 485 490 495

Asp Lys Ser Trp His Val Leu Gly Leu Gly Tyr Asn Pro Gly Val Ser
500 505 510

Met Asp Glu Ile Arg Asn Ala Gly Val Ile His Tyr Asn Gly Asn Met
515 520 525

Lys Pro Trp Leu Asp Ile Ala Met Asn Gln Tyr Lys Ser Leu Trp Thr
530 535 540

Lys Tyr Val Asp Asn Glu Met Glu Phe Val Gln Met Cys Asn Phe Gly
545 550 555 560

Leu

<210> 21
<211> 1680
<212> DNA
<213> Arabidopsis thaliana

<400> 21
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aattacacgg atctgattaa caaacgcagc tatcgagctt tgtatgattc tgatggagcc 420
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cgggagctcg aggatccgaa tctttaccat tacgctatat ttccggataa tgtgattgcg 780
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<210> 22
 <211> 559
 <212> PRT
 <213> *Arabidopsis thaliana*

<400> 22

Met Ala Asn His His Arg Leu Leu Arg Gly Gly Gly Ser Pro Ala Ile
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Ile Gly Gly Arg Ile Thr Leu Thr Ala Phe Ala Ser Thr Ile Ala Leu
 20 25 30

Phe Leu Phe Thr Leu Ser Phe Phe Phe Ala Ser Asp Ser Asn Asp Ser
 35 40 45

Pro Asp Leu Leu Leu Pro Gly Val Glu Tyr Ser Asn Gly Val Gly Ser
 50 55 60

Arg Arg Ser Met Leu Asp Ile Lys Ser Asp Pro Leu Lys Pro Arg Leu
 65 70 75 80

Ile Gln Ile Arg Lys Gln Ala Asp Asp His Arg Ser Leu Ala Leu Ala
 85 90 95

Tyr Ala Ser Tyr Ala Arg Lys Leu Lys Leu Glu Asn Ser Lys Leu Val
 100 105 110

Arg Ile Phe Ala Asp Leu Ser Arg Asn Tyr Thr Asp Leu Ile Asn Lys
 115 120 125

Pro Thr Tyr Arg Ala Leu Tyr Asp Ser Asp Gly Ala Ser Ile Glu Glu
 130 135 140

Ser Val Leu Arg Gln Phe Glu Lys Glu Val Lys Glu Arg Ile Lys Met
 145 150 155 160

Thr Arg Gln Val Ile Ala Glu Ala Lys Glu Ser Phe Asp Asn Gln Leu
 165 170 175

Lys Ile Gln Lys Leu Lys Asp Thr Ile Phe Ala Val Asn Glu Gln Leu
 180 185 190

Thr Asn Ala Lys Lys Gln Gly Ala Phe Ser Ser Leu Ile Ala Ala Lys
 195 200 205

Ser Ile Pro Lys Gly Leu His Cys Leu Ala Met Arg Leu Met Glu Glu
 210 215 220

Arg Ile Ala His Pro Glu Lys Tyr Thr Asp Glu Gly Lys Asp Arg Pro
 225 230 235 240

Arg Glu Leu Glu Asp Pro Asn Leu Tyr His Tyr Ala Ile Phe Ser Asp
 245 250 255

Asn Val Ile Ala Ala Ser Val Val Val Asn Ser Ala Val Lys Asn Ala
 260 265 270

Lys Glu Pro Trp Lys His Val Phe His Val Val Thr Asp Lys Met Asn
 275 280 285

Leu Gly Ala Met Gln Val Met Phe Lys Leu Lys Glu Tyr Lys Gly Ala
 290 295 300

His Val Glu Val Lys Ala Val Glu Asp Tyr Thr Phe Leu Asn Ser Ser
 305 310 315 320

Tyr Val Pro Val Leu Lys Gln Leu Glu Ser Ala Asn Leu Gln Lys Phe
 325 330 335

Tyr Phe Glu Asn Lys Leu Glu Asn Ala Thr Lys Asp Thr Thr Asn Met
 340 345 350

Lys Phe Arg Asn Pro Lys Tyr Leu Ser Ile Leu Asn His Leu Arg Phe
 355 360 365

Tyr Leu Pro Glu Met Tyr Pro Lys Leu His Arg Ile Leu Phe Leu Asp
 370 375 380

Asp Asp Val Val Val Gln Lys Asp Leu Thr Gly Leu Trp Glu Ile Asp
385 390 395 400

Met Asp Gly Lys Val Asn Gly Ala Val Glu Thr Cys Phe Gly Ser Phe
405 410 415

His Arg Tyr Ala Gln Tyr Met Asn Phe Ser His Pro Leu Ile Lys Glu
420 425 430

Lys Phe Asn Pro Lys Ala Cys Ala Trp Ala Tyr Gly Met Asn Phe Phe
435 440 445

Asp Leu Asp Ala Trp Arg Arg Glu Lys Cys Thr Glu Glu Tyr His Tyr
450 455 460

Trp Gln Asn Leu Asn Glu Asn Arg Ala Leu Trp Lys Leu Gly Thr Leu
465 470 475 480

Pro Pro Gly Leu Ile Thr Phe Tyr Ser Thr Thr Lys Pro Leu Asp Lys
485 490 495

Ser Trp His Val Leu Gly Leu Gly Tyr Asn Pro Ser Ile Ser Met Asp
500 505 510

Glu Ile Arg Asn Ala Ala Val Val His Phe Asn Gly Asn Met Lys Pro
515 520 525

Trp Leu Asp Ile Ala Met Asn Gln Phe Arg Pro Leu Trp Thr Lys His
530 535 540

Val Asp Tyr Asp Leu Glu Phe Val Gln Ala Cys Asn Phe Gly Leu
545 550 555

<210> 23
<211> 1623
<212> DNA
<213> Arabidopsis thaliana

<400> 23
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<213> Arabidopsis thaliana

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<400> 24

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Asn Pro Gly Val Gly Ile Gly Lys Gly Ser Gly Gly Cys Ala Ala Ala
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Val Glu Val Lys Gly Leu His Gln Tyr Asp Trp Pro Gln Glu Val Asn
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Phe Lys Val Arg Glu Met Leu Asp Ile His Arg Leu Ile Trp Arg Arg
 290 295 300

His Tyr Gln Asn Leu Lys Asp Ser Asp Phe Ser Phe Val Glu Gly Thr
 305 310 315 320

His Glu Gln Ser Leu Gln Ala Leu Asn Pro Ser Cys Leu Ala Leu Leu
 325 330 335

Asn His Leu Arg Ile Tyr Ile Pro Lys Leu Phe Pro Asp Leu Asn Lys
 340 345 350

Ile Val Leu Leu Asp Asp Asp Val Val Val Gln Ser Asp Leu Ser Ser
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Leu Trp Glu Thr Asp Leu Asn Gly Lys Val Val Gly Ala Val Val Asp
 370 375 380

Ser Trp Cys Gly Asp Asn Cys Cys Pro Gly Arg Lys Tyr Lys Asp Tyr
 385 390 395 400

Phe Asn Phe Ser His Pro Leu Ile Ser Ser Asn Leu Val Gln Glu Asp
 405 410 415

Cys Ala Trp Leu Ser Gly Met Asn Val Phe Asp Leu Lys Ala Trp Arg
 420 425 430

Gln Thr Asn Ile Thr Glu Ala Tyr Ser Thr Trp Leu Arg Leu Ser Val
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Arg Ser Gly Leu Gln Leu Trp Gln Pro Gly Ala Leu Pro Pro Thr Leu
 450 455 460

Leu Ala Phe Lys Gly Leu Thr Gln Ser Leu Glu Pro Ser Trp His Val
 465 470 475 480

Ala Gly Leu Gly Ser Arg Ser Val Lys Ser Pro Gln Glu Ile Leu Lys
 485 490 495

Ser Ala Ser Val Leu His Phe Ser Gly Pro Ala Lys Pro Trp Leu Glu
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Ile Ser Asn Pro Glu Val Arg Ser Leu Trp Tyr Arg Tyr Val Asn Ser
515 520 525

Ser Asp Ile Phe Val Arg Lys Cys Lys Ile Met Asn
530 535 540

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tga 2043

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<212> PRT
<213> Arabidopsis thaliana

<400> 26

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35 40 45

Glu Val Tyr Ala Ser Ser Ala Ala Ala Val His Tyr Asp Pro Asp Leu
50 55 60

Lys Asp Val Asn Ile Val Ala Thr Tyr Ser Asp His Tyr Gly Asn Ile
65 70 75 80

Arg Leu Gly Arg Val Lys Met Gly Asp Leu Ser Pro Ser Trp Val Leu
85 90 95

Glu Asn Pro Ala Tyr Gln Val Ser Arg Lys Thr Lys Gly Ser Gln Leu
100 105 110

Val Ile Pro Arg Asp Ser Phe Gln Asn Asp Thr Gly Met Glu Asp Asn
115 120 125

Ala	Ser	His	Ser	Thr	Thr	Asn	Gln	Thr	Asp	Glu	Ser	Glu	Asn	Gln	Phe	130	135	140
Pro	Asn	Val	Asp	Phe	Ala	Ser	Pro	Ala	Lys	Leu	Lys	Arg	Gln	Ile	Leu	145	150	155
Arg	Gln	Glu	Arg	Arg	Gly	Gln	Arg	Thr	Leu	Glu	Leu	Ile	Arg	Gln	Glu	165	170	175
Lys	Glu	Thr	Asp	Glu	Gln	Met	Gln	Glu	Ala	Ala	Ile	Gln	Lys	Ser	Met	180	185	190
Ser	Phe	Glu	Asn	Ser	Val	Ile	Gly	Lys	Tyr	Ser	Ile	Trp	Arg	Arg	Asp	195	200	205
Tyr	Glu	Ser	Pro	Asn	Ala	Asp	Ala	Ile	Leu	Lys	Leu	Met	Arg	Asp	Gln	210	215	220
Ile	Ile	Met	Ala	Lys	Ala	Tyr	Ala	Asn	Ile	Ala	Lys	Ser	Lys	Asn	Val	225	230	235
Thr	Asn	Leu	Tyr	Val	Phe	Leu	Met	Gln	Gln	Cys	Gly	Glu	Asn	Lys	Arg	245	250	255
Val	Ile	Gly	Lys	Ala	Thr	Ser	Asp	Ala	Asp	Leu	Pro	Ser	Ser	Ala	Leu	260	265	270
Asp	Gln	Ala	Lys	Ala	Met	Gly	His	Ala	Leu	Ser	Leu	Ala	Lys	Asp	Glu	275	280	285
Leu	Tyr	Asp	Cys	His	Glu	Leu	Ala	Lys	Lys	Phe	Arg	Ala	Ile	Leu	Gln	290	295	300
Ser	Thr	Glu	Arg	Lys	Val	Asp	Gly	Leu	Lys	Lys	Lys	Gly	Thr	Phe	Leu	305	310	315
Ile	Gln	Leu	Ala	Ala	Lys	Thr	Phe	Pro	Lys	Pro	Leu	His	Cys	Leu	Ser	325	330	335
Leu	Gln	Leu	Ala	Ala	Asp	Tyr	Phe	Ile	Leu	Gly	Phe	Asn	Glu	Glu	Asp	340	345	350
Ala	Val	Lys	Glu	Asp	Val	Ser	Gln	Lys	Lys	Leu	Glu	Asp	Pro	Ser	Leu	355	360	365

Tyr His Tyr Ala Ile Phe Ser Asp Asn Val Leu Ala Thr Ser Val Val
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 Val Asn Ser Thr Val Leu Asn Ala Lys Glu Pro Gln Arg His Val Phe
 385 390 395 400
 His Ile Val Thr Asp Lys Leu Asn Phe Gly Ala Met Lys Met Trp Phe
 405 410 415
 Arg Ile Asn Ala Pro Ala Asp Ala Thr Ile Gln Val Glu Asn Ile Asn
 420 425 430
 Asp Phe Lys Trp Leu Asn Ser Ser Tyr Cys Ser Val Leu Arg Gln Leu
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 Glu Ser Ala Arg Leu Lys Glu Tyr Tyr Phe Lys Ala Asn His Pro Ser
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 Ser Ile Ser Ala Gly Ala Asp Asn Leu Lys Tyr Arg Asn Pro Lys Tyr
 465 470 475 480
 Leu Ser Met Leu Asn His Leu Arg Phe Tyr Leu Pro Glu Val Tyr Pro
 485 490 495
 Lys Leu Glu Lys Ile Leu Phe Leu Asp Asp Asp Ile Val Val Gln Lys
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 Asp Leu Ala Pro Leu Trp Glu Ile Asp Met Gln Gly Lys Val Asn Gly
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 Ala Val Glu Thr Cys Lys Glu Ser Phe His Arg Phe Asp Lys Tyr Leu
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 Asn Phe Ser Asn Pro Lys Ile Ser Glu Asn Phe Asp Ala Gly Ala Cys
 545 550 555 560
 Gly Trp Ala Phe Gly Met Asn Met Phe Asp Leu Lys Glu Trp Arg Lys
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 Arg Asn Ile Thr Gly Ile Tyr His Tyr Trp Gln Asp Leu Asn Glu Asp
 580 585 590
 Arg Thr Leu Trp Lys Leu Gly Ser Leu Pro Pro Gly Leu Ile Thr Phe
 595 600 605
 Tyr Asn Leu Thr Tyr Ala Met Asp Arg Ser Trp His Val Leu Gly Leu

610	615	620
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Val His Tyr Asn Gly Asn Tyr Lys Pro Trp Leu Gly Leu Ala Phe Ala		
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<210> 28
<211> 532
<212> PRT
<213> Arabidopsis thaliana

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<400> 28

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Met Gln Leu His Ile Ser Pro Ser Met Arg Ser Ile Thr Ile Ser Ser
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Ser Asn Glu Phe Ile Asp Leu Met Lys Ile Lys Val Ala Ala Arg His
          20           25           30

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Ile Ser Tyr Arg Thr Leu Phe His Thr Ile Leu Ile Leu Ala Phe Leu
      35           40           45

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Leu Pro Phe Val Phe Ile Leu Thr Ala Val Val Thr Leu Glu Gly Val
      50           55           60

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Asn Lys Cys Ser Ser Ile Asp Cys Leu Gly Arg Arg Ile Gly Pro Arg
65           70           75           80

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Leu Leu Gly Arg Val Asp Asp Ser Glu Arg Leu Ala Arg Asp Phe Tyr
      85           90           95

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Lys Ile Leu Asn Glu Val Ser Thr Gln Glu Ile Pro Asp Gly Leu Lys
      100           105           110

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Leu Pro Asn Ser Phe Ser Gln Leu Val Ser Asp Met Lys Asn Asn His
      115           120           125

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Tyr Asp Ala Lys Thr Phe Ala Leu Val Leu Arg Ala Met Met Glu Lys
      130           135           140

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Phe Glu Arg Asp Met Arg Glu Ser Lys Phe Ala Glu Leu Met Asn Lys
145 150 155 160

His Phe Ala Ala Ser Ser Ile Pro Lys Gly Ile His Cys Leu Ser Leu
165 170 175

Arg Leu Thr Asp Glu Tyr Ser Ser Asn Ala His Ala Arg Arg Gln Leu
180 185 190

Pro Ser Pro Glu Phe Leu Pro Val Leu Ser Asp Asn Ala Tyr His His
195 200 205

Phe Ile Leu Ser Thr Asp Asn Ile Leu Ala Ala Ser Val Val Val Ser
210 215 220

Ser Ala Val Gln Ser Ser Ser Lys Pro Glu Lys Ile Val Phe His Ile
225 230 235 240

Ile Thr Asp Lys Lys Thr Tyr Ala Gly Met His Ser Trp Phe Ala Leu
245 250 255

Asn Ser Val Ala Pro Ala Ile Val Glu Val Lys Gly Val His Gln Phe
260 265 270

Asp Trp Leu Thr Arg Glu Asn Val Pro Val Leu Glu Ala Val Glu Ser
275 280 285

His Asn Gly Val Arg Asp Tyr Tyr His Gly Asn His Val Ala Gly Ala
290 295 300

Asn Leu Thr Glu Thr Thr Pro Arg Thr Phe Ala Ser Lys Leu Gln Ser
305 310 315 320

Arg Ser Pro Lys Tyr Ile Ser Leu Leu Asn His Leu Arg Ile Tyr Ile
325 330 335

Pro Glu Leu Phe Pro Asn Leu Asp Lys Val Val Phe Leu Asp Asp Asp
340 345 350

Ile Val Val Gln Gly Asp Leu Thr Pro Leu Trp Asp Val Asp Leu Gly
355 360 365

Gly Lys Val Asn Gly Ala Val Glu Thr Cys Arg Gly Glu Asp Glu Trp
370 375 380

Val Met Ser Lys Arg Leu Arg Asn Tyr Phe Asn Phe Ser His Pro Leu
385 390 395 400

Ile Ala Lys His Leu Asp Pro Glu Glu Cys Ala Trp Ala Tyr Gly Met
405 410 415

Asn Ile Phe Asp Leu Gln Ala Trp Arg Lys Thr Asn Ile Arg Glu Thr

Tyr His Ser Trp Leu Arg Glu Asn Leu Lys Ser Asn Leu Thr Met Trp
435 440 445

Lys Leu Gly Thr Leu Pro Pro Ala Leu Ile Ala Phe Lys Gly His Val
450 455 460

His Ile Ile Asp Ser Ser Trp His Met Leu Gly Leu Gly Tyr Gln Ser
465 470 475 480

Lys Thr Asn Ile Glu Asn Val Lys Lys Ala Ala Val Ile His Tyr Asn
485 490 495

Gly Gln Ser Lys Pro Trp Leu Glu Ile Gly Phe Glu His Leu Arg Pro
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Phe Trp Thr Lys Tyr Val Asn Tyr Ser Asn Asp Phe Ile Lys Asn Cys
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His Ile Leu Glu
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 <212> PRT
 <213> Arabidopsis thaliana

<400> 30

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Gly Lys Gly Leu Arg Glu Phe Ile Lys Val Lys Val Gly Ser Arg Arg
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Phe Ser Tyr Gln Met Val Phe Tyr Ser Leu Leu Phe Phe Thr Phe Leu
 35 40 45

Leu Arg Phe Val Phe Val Leu Ser Thr Val Asp Thr Ile Asp Gly Asp
 50 55 60

Pro Ser Pro Cys Ser Ser Leu Ala Cys Leu Gly Lys Arg Leu Lys Pro

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Lys	Leu	Leu	Gly	Arg	Arg	Val	Asp	Ser	Gly	Asn	Val	Pro	Glu	Ala	Met
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Tyr	Gln	Val	Leu	Glu	Gln	Pro	Leu	Ser	Glu	Gln	Glu	Leu	Lys	Gly	Arg
		100						105					110		
Ser	Asp	Ile	Pro	Gln	Thr	Leu	Gln	Asp	Phe	Met	Ser	Glu	Val	Lys	Arg
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Ser	Lys	Ser	Asp	Ala	Arg	Glu	Phe	Ala	Gln	Lys	Leu	Lys	Glu	Met	Val
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Thr	Leu	Met	Glu	Gln	Arg	Thr	Arg	Thr	Ala	Lys	Ile	Gln	Glu	Tyr	Leu
145					150					155					160
Tyr	Arg	His	Val	Ala	Ser	Ser	Ser	Ile	Pro	Lys	Gln	Leu	His	Cys	Leu
			165						170					175	
Ala	Leu	Lys	Leu	Ala	Asn	Glu	His	Ser	Ile	Asn	Ala	Ala	Ala	Arg	Leu
			180					185					190		
Gln	Leu	Pro	Glu	Ala	Glu	Leu	Val	Pro	Met	Leu	Val	Asp	Asn	Asn	Tyr
		195					200					205			
Phe	His	Phe	Val	Leu	Ala	Ser	Asp	Asn	Ile	Leu	Ala	Ala	Ser	Val	Val
	210					215					220				
Ala	Lys	Ser	Leu	Val	Gln	Asn	Ala	Leu	Arg	Pro	His	Lys	Ile	Val	Leu
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His	Ile	Ile	Thr	Asp	Arg	Lys	Thr	Tyr	Phe	Pro	Met	Gln	Ala	Trp	Phe
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Ser	Leu	His	Pro	Leu	Ser	Pro	Ala	Ile	Ile	Glu	Val	Lys	Ala	Leu	His
			260					265					270		
His	Phe	Asp	Trp	Leu	Ser	Lys	Gly	Lys	Val	Pro	Val	Leu	Glu	Ala	Met
		275					280					285			
Glu	Lys	Asp	Gln	Arg	Val	Arg	Ser	Gln	Phe	Arg	Gly	Gly	Ser	Ser	Val
	290					295					300				
Ile	Val	Ala	Asn	Asn	Lys	Glu	Asn	Pro	Val	Val	Val	Ala	Ala	Lys	Leu
305					310					315					320

Gln Ala Leu Ser Pro Lys Tyr Asn Ser Leu Met Asn His Ile Arg Ile
 325 330 335
 His Leu Pro Glu Leu Phe Pro Ser Leu Asn Lys Val Val Phe Leu Asp
 340 345 350
 Asp Asp Ile Val Ile Gln Thr Asp Leu Ser Pro Leu Trp Asp Ile Asp
 355 360 365
 Met Asn Gly Lys Val Asn Gly Ala Val Glu Thr Cys Arg Gly Glu Asp
 370 375 380
 Lys Phe Val Met Ser Lys Lys Phe Lys Ser Tyr Leu Asn Phe Ser Asn
 385 390 395 400
 Pro Thr Ile Ala Lys Asn Phe Asn Pro Glu Glu Cys Ala Trp Ala Tyr
 405 410 415
 Gly Met Asn Val Phe Asp Leu Ala Ala Trp Arg Arg Thr Asn Ile Ser
 420 425 430
 Ser Thr Tyr Tyr His Trp Leu Asp Glu Asn Leu Lys Ser Asp Leu Ser
 435 440 445
 Leu Trp Gln Leu Gly Thr Leu Pro Pro Gly Leu Ile Ala Phe His Gly
 450 455 460
 His Val Gln Thr Ile Asp Pro Phe Trp His Met Leu Gly Leu Gly Tyr
 465 470 475 480
 Gln Glu Thr Thr Ser Tyr Ala Asp Ala Glu Ser Ala Ala Val Val His
 485 490 495
 Phe Asn Gly Arg Ala Lys Pro Trp Leu Asp Ile Ala Phe Pro His Leu
 500 505 510
 Arg Pro Leu Trp Ala Lys Tyr Leu Asp Ser Ser Asp Arg Phe Ile Lys
 515 520 525
 Ser Cys His Ile Arg Ala Ser
 530 535

<210> 31
 <211> 1086
 <212> DNA

<213> Arabidopsis thaliana

<400> 31

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tctccttcgc tccaatcctt ttctccggcg gcagctatcc gatcatctca cccctacgcc      120
gacgaattca aacccaaca aaactccgat tactcctcct tcagagaatc tccaatgttc      180
cgtaacgccg aacaatgcag atcttccggc gaagattccg gcgtctgtaa ccctaattctc      240
gtccacgtag ccatcactct cgacatcgat tacctccgtg gctcaatcgc agccgtcaat      300
tcgatcctcc agcactcaat gtgccctcaa agcgtcttct tccacttctc cgtctcctcc      360
gagtctcaaa acctagaatc tctgattcgt tctactttcc ccaaattgac gaatctcaaa      420
atttactatt ttgccctga gaccgtacag tctttgattt catcttccgt gagacaagcc      480
ctagagcaac cgttgaatta cgccagaaat tacttggcgg atctgctcga gccttgcggt      540
aagcgagtca tctacttgga ttccgatctc gtcgtcgtcg atgatatcgt caagctttgg      600
aaaacggggt taggccagag aacaatcgga gtcgccgagt attgtcacgc gaatttcacg      660
aaatacttca ccggagggtt ttggtcagat aagagggtta acgggacggt caaagggagg      720
aacccttggt acttcaatac tgggtgaatg gtgattgatt tgaagaagtg gagacaattt      780
aggttcacga aacgaattga gaaatggatg gagattcaga agatagagag gatttatgag      840
cttggttctc ttctccggtt tcttctggta tttgctggtc atgtagctcc gatttcacat      900
cggtggaatc aacatgggct tgggtggtgat aatggttagag gtagttgccg tgatttgcat      960
tctggtcctg tgagtttgct tcaactggta ggtagtggtg agccatgggt aagactcgat     1020
tccaagcttc catgtccttt agacacattg tgggcacctt atgatttgta taaacactcc     1080
cattga                                                                1086
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<210> 32

<211> 361

<212> PRT

<213> Arabidopsis thaliana

<400> 32

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Met His Trp Ile Thr Arg Phe Ser Ala Phe Phe Ser Ala Ala Leu Ala
1              5              10              15
```

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Met Ile Leu Leu Ser Pro Ser Leu Gln Ser Phe Ser Pro Ala Ala Ala
                20              25              30
```

```
Ile Arg Ser Ser His Pro Tyr Ala Asp Glu Phe Lys Pro Gln Gln Asn
35              40              45
```

Ser Asp Tyr Ser Ser Phe Arg Glu Ser Pro Met Phe Arg Asn Ala Glu
 50 55 60

Gln Cys Arg Ser Ser Gly Glu Asp Ser Gly Val Cys Asn Pro Asn Leu
 65 70 75 80

Val His Val Ala Ile Thr Leu Asp Ile Asp Tyr Leu Arg Gly Ser Ile
 85 90 95

Ala Ala Val Asn Ser Ile Leu Gln His Ser Met Cys Pro Gln Ser Val
 100 105 110

Phe Phe His Phe Leu Val Ser Ser Glu Ser Gln Asn Leu Glu Ser Leu
 115 120 125

Ile Arg Ser Thr Phe Pro Lys Leu Thr Asn Leu Lys Ile Tyr Tyr Phe
 130 135 140

Ala Pro Glu Thr Val Gln Ser Leu Ile Ser Ser Ser Val Arg Gln Ala
 145 150 155 160

Leu Glu Gln Pro Leu Asn Tyr Ala Arg Asn Tyr Leu Ala Asp Leu Leu
 165 170 175

Glu Pro Cys Val Lys Arg Val Ile Tyr Leu Asp Ser Asp Leu Val Val
 180 185 190

Val Asp Asp Ile Val Lys Leu Trp Lys Thr Gly Leu Gly Gln Arg Thr
 195 200 205

Ile Gly Ala Pro Glu Tyr Cys His Ala Asn Phe Thr Lys Tyr Phe Thr
 210 215 220

Gly Gly Phe Trp Ser Asp Lys Arg Phe Asn Gly Thr Phe Lys Gly Arg
 225 230 235 240

Asn Pro Cys Tyr Phe Asn Thr Gly Val Met Val Ile Asp Leu Lys Lys
 245 250 255

Trp Arg Gln Phe Arg Phe Thr Lys Arg Ile Glu Lys Trp Met Glu Ile
 260 265 270

Gln Lys Ile Glu Arg Ile Tyr Glu Leu Gly Ser Leu Pro Pro Phe Leu
 275 280 285

Leu Val Phe Ala Gly His Val Ala Pro Ile Ser His Arg Trp Asn Gln
 290 295 300

His Gly Leu Gly Gly Asp Asn Val Arg Gly Ser Cys Arg Asp Leu His
 305 310 315 320

Ser Gly Pro Val Ser Leu Leu His Trp Ser Gly Ser Gly Lys Pro Trp
 325 330 335

Leu Arg Leu Asp Ser Lys Leu Pro Cys Pro Leu Asp Thr Leu Trp Ala
 340 345 350

Pro Tyr Asp Leu Tyr Lys His Ser His
 355 360

<210> 33
 <211> 1038
 <212> DNA
 <213> Arabidopsis thaliana

<400> 33
 atgtcttctc tgcgtttgcg tttatgtctt cttctactct tacctatcac aattagctgc 60
 gtcacagtca ctctcactga cctccccgcg tttcgtgaag ctccggcggt tcgaaacggc 120
 agagaatgct ccaaaacgac atggatacct tcggatcacg aacacaacc atcaatcatc 180
 cacatcgcta tgactctcga cgcaatttac ctccgtggct cagtcgccgg cgtcttctcc 240
 gttctccaac acgcttcttg tctgaaaac atcgttttcc acttcatcgc cactcaccgt 300
 cgcagcgccg atctccgccg cataatctcc tcaacattcc catacctaac ctaccacatt 360
 taccattttg accctaacct cgtccgcagc aaaatatctt cctctattcg tcgtgcttta 420
 gaccaaccgt taaactacgc tcggatctac ctgcgcgatc tcttcccaat cgccgtccgc 480
 cgcgtaatct acttcgactc cgatctcgta gtcgtcgatg acgtggctaa actctggaga 540
 atcgatctac gtcggcacgt cgtcggagct ccggagtact gtcacgcgaa tttcactaac 600
 tacttcactt caagattctg gtcgagtcaa ggttacaaat cggcgttgaa agataggaaa 660
 ccgtgttatt tcaacaccgg agtgatggtg attgatctcg gaaaatggag agaaaggaga 720
 gtcacggtga agctagagac atggatgagg attcaaaaac gacatcgtat ttacgaattg 780
 ggatctttgc ctccgtttct gtcggttttc gccggagatg ttgagccggt ggagcatagg 840
 tggaatcagc atggtcttgg tggtgataac ttggaaggac tttgccggaa tttgcatcca 900
 ggtccggtga gtttgttgca ttggagcggg aaagggaaac catggctaag gcttgactcg 960
 agacgaccgt gtccgttggg ttcgttatgg gtccttatg atttgtttcg ttattcaccg 1020
 ttgatctctg atagctga 1038

<210> 34
 <211> 345
 <212> PRT
 <213> Arabidopsis thaliana

<400> 34

Met Ser Ser Leu Arg Leu Arg Leu Cys Leu Leu Leu Leu Leu Pro Ile
 1 5 10 15

Thr Ile Ser Cys Val Thr Val Thr Leu Thr Asp Leu Pro Ala Phe Arg
 20 25 30

Glu Ala Pro Ala Phe Arg Asn Gly Arg Glu Cys Ser Lys Thr Thr Trp
 35 40 45

Ile Pro Ser Asp His Glu His Asn Pro Ser Ile Ile His Ile Ala Met
 50 55 60

Thr Leu Asp Ala Ile Tyr Leu Arg Gly Ser Val Ala Gly Val Phe Ser
 65 70 75 80

Val Leu Gln His Ala Ser Cys Pro Glu Asn Ile Val Phe His Phe Ile
 85 90 95

Ala Thr His Arg Arg Ser Ala Asp Leu Arg Arg Ile Ile Ser Ser Thr
 100 105 110

Phe Pro Tyr Leu Thr Tyr His Ile Tyr His Phe Asp Pro Asn Leu Val
 115 120 125

Arg Ser Lys Ile Ser Ser Ser Ile Arg Arg Ala Leu Asp Gln Pro Leu
 130 135 140

Asn Tyr Ala Arg Ile Tyr Leu Ala Asp Leu Leu Pro Ile Ala Val Arg
 145 150 155 160

Arg Val Ile Tyr Phe Asp Ser Asp Leu Val Val Val Asp Asp Val Ala
 165 170 175

Lys Leu Trp Arg Ile Asp Leu Arg Arg His Val Val Gly Ala Pro Glu
 180 185 190

Tyr Cys His Ala Asn Phe Thr Asn Tyr Phe Thr Ser Arg Phe Trp Ser
 195 200 205

Ser Gln Gly Tyr Lys Ser Ala Leu Lys Asp Arg Lys Pro Cys Tyr Phe
 210 215 220

Asn Thr Gly Val Met Val Ile Asp Leu Gly Lys Trp Arg Glu Arg Arg
225 230 235 240

Val Thr Val Lys Leu Glu Thr Trp Met Arg Ile Gln Lys Arg His Arg
245 250 255

Ile Tyr Glu Leu Gly Ser Leu Pro Pro Phe Leu Leu Val Phe Ala Gly
260 265 270

Asp Val Glu Pro Val Glu His Arg Trp Asn Gln His Gly Leu Gly Gly
275 280 285

Asp Asn Leu Glu Gly Leu Cys Arg Asn Leu His Pro Gly Pro Val Ser
290 295 300

Leu Leu His Trp Ser Gly Lys Gly Lys Pro Trp Leu Arg Leu Asp Ser
305 310 315 320

Arg Arg Pro Cys Pro Leu Asp Ser Leu Trp Ala Pro Tyr Asp Leu Phe
325 330 335

Arg Tyr Ser Pro Leu Ile Ser Asp Ser
340 345

<210> 35
<211> 1056
<212> DNA
<213> Arabidopsis thaliana

<400> 35
atgtcccaac atcttcttct tctcattctc ctctcgctac ttcttcttca taaacccatt 60
tccgccacta caattattca aaaattcaaa gaagccccac agttttacaa ttctgcagat 120
tgccccttaa tcgatgactc cgagtccgac gatgacgtgg tcgccaaacc aatcttctgc 180
tcacgtcgag ctgtccacgt ggcgatgaca ctcgacgccg cctacattcg tggctcagtc 240
gccgctgttc tctccgtcct ccaacactct tcttgtcttg aaaacattgt tttccacttc 300
gtcgcctctg cttccgccga cgcttcttcc ttacgagcca ccatatcctc ctctttccct 360
taccttgatt tcaccgtcta cgtcttcaac gtctcctcgg tctctcgctt tatctcctcc 420
tctatccgct ccgcactaga ctgtccttta aactacgcaa gaagctacct cgccgatctc 480
ctccctccct gcgtccgccg cgctgtctac ctagactcgg atctgacccg cgctcgacgac 540
atagcaaaac tcgccgccac agatctcggc cgtgattcag tcctcgccgc gccggaatac 600
tgcaacgccca atttcacttc atacttcaca tcaaccttct ggtctaatac gactctctct 660

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ttaaccttcg ccgatcggaa agcatgctac ttcaacactg gagtcatggg gatcgatctt 720
tcccgggtggc gcgaaggcgc gtacacgtca cgcatacgaag agtggatggc gatgcaaaag 780
agaatgagaa tttacgagct tggttcgtta ccaccgtttt tattgggtttt tgccgggtttg 840
attaaaccgg ttaatcatcg gtggaaccaa cacgggtttag gaggtgataa tttcagagga 900
ctgtgtagag atctccatcc tgggtccgggtg agtctgtttgc attggagtgg gaaaggtaag 960
ccatgggcta ggcttgatgc tggtcggcct tgtccttttag acgcgctttg ggctccgtat 1020
gatcttcttc aaacgccgtt cgcgttggat tcttga 1056

```

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<210> 36
<211> 351
<212> PRT
<213> Arabidopsis thaliana

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<400> 36

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Met Ser Gln His Leu Leu Leu Leu Ile Leu Leu Ser Leu Leu Leu Leu
1          5          10          15

```

```

His Lys Pro Ile Ser Ala Thr Thr Ile Ile Gln Lys Phe Lys Glu Ala
          20          25          30

```

```

Pro Gln Phe Tyr Asn Ser Ala Asp Cys Pro Leu Ile Asp Asp Ser Glu
          35          40          45

```

```

Ser Asp Asp Asp Val Val Ala Lys Pro Ile Phe Cys Ser Arg Arg Ala
50          55          60

```

```

Val His Val Ala Met Thr Leu Asp Ala Ala Tyr Ile Arg Gly Ser Val
65          70          75          80

```

```

Ala Ala Val Leu Ser Val Leu Gln His Ser Ser Cys Pro Glu Asn Ile
          85          90          95

```

```

Val Phe His Phe Val Ala Ser Ala Ser Ala Asp Ala Ser Ser Leu Arg
          100          105          110

```

```

Ala Thr Ile Ser Ser Ser Phe Pro Tyr Leu Asp Phe Thr Val Tyr Val
          115          120          125

```

```

Phe Asn Val Ser Ser Val Ser Arg Leu Ile Ser Ser Ser Ile Arg Ser
          130          135          140

```

```

Ala Leu Asp Cys Pro Leu Asn Tyr Ala Arg Ser Tyr Leu Ala Asp Leu
145          150          155          160

```

Leu Pro Pro Cys Val Arg Arg Val Val Tyr Leu Asp Ser Asp Leu Ile
165 170 175

Leu Val Asp Asp Ile Ala Lys Leu Ala Ala Thr Asp Leu Gly Arg Asp
180 185 190

Ser Val Leu Ala Ala Pro Glu Tyr Cys Asn Ala Asn Phe Thr Ser Tyr
195 200 205

Phe Thr Ser Thr Phe Trp Ser Asn Pro Thr Leu Ser Leu Thr Phe Ala
210 215 220

Asp Arg Lys Ala Cys Tyr Phe Asn Thr Gly Val Met Val Ile Asp Leu
225 230 235 240

Ser Arg Trp Arg Glu Gly Ala Tyr Thr Ser Arg Ile Glu Glu Trp Met
245 250 255

Ala Met Gln Lys Arg Met Arg Ile Tyr Glu Leu Gly Ser Leu Pro Pro
260 265 270

Phe Leu Leu Val Phe Ala Gly Leu Ile Lys Pro Val Asn His Arg Trp
275 280 285

Asn Gln His Gly Leu Gly Gly Asp Asn Phe Arg Gly Leu Cys Arg Asp
290 295 300

Leu His Pro Gly Pro Val Ser Leu Leu His Trp Ser Gly Lys Gly Lys
305 310 315 320

Pro Trp Ala Arg Leu Asp Ala Gly Arg Pro Cys Pro Leu Asp Ala Leu
325 330 335

Trp Ala Pro Tyr Asp Leu Leu Gln Thr Pro Phe Ala Leu Asp Ser
340 345 350

<210> 37
<211> 1182
<212> DNA
<213> Arabidopsis thaliana

<400> 37
atgtcgtcgc gtttttcttt gacggtggtg tgtttgattg ctctgttacc gtttgttggt 60
ggtatacggg tgattccggc gaggatcacg agtgtcgggt atggcggcgg cggaggagggt 120
aataatgggt ttagtaaaact tgggtccgttt atggaagctc cggagtatag aaacggcaag 180

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gagtgtgtat cttcatcagt gaacagagag aacttcgtgt cgtcttcttc tagttctaata 240
gatccttcgc ttgttcacat cgctatgact ttggactcag agtatctccg tggatcaatc 300
gcagccgttc attctgttct tcgccacgcg tcttgtccag agaacgtctt cttccatttc 360
atcgctgctg agtttgactc tgcgagtcct cgtgttctga gtcaactcgt gaggtcgact 420
tttccttcgt tgaactttaa agtctacatt tttagggaag atacggtgat caatctcata 480
tcttcttcga ttagactagc tttggagaat ccgttgaact atgctcggaa ctatctcgga 540
gatattcttg atcgaagtgt tgaacgagtc atttatcttg actcggatgt tataactgtg 600
gatgatatca caaagctttg gaacacgggt ttgaccgggt cagagtcac cggagctccg 660
gagtattgtc acgcgaactt cactcagtat ttcacttccg ggttctggtc agaccgggt 720
ttaccgggtc taatctcggg tcaaaagcct tgctatttca acacaggagt gatggtgatg 780
gatcttgta gatggagaga agggaattac agagagaagt tagagcaatg gatgcaattg 840
cagaagaaga tgagaatcta cgatcttggg tcattaccac cgtttctttt ggtgtttgcg 900
ggtaatgttg aagctattga tcatagatgg aaccaacatg gtttaggagg agacaatata 960
cgaggaagtt gtcggtcatt gcatectggc cctgtgagct tgttgcatg gagtggtaaa 1020
ggtaagccat gggtttagact tgatgagaag aggccttgtc cgttgatca tctttgggag 1080
ccatatgatt tgtataagca taagattgag agagctaaag atcagtcctc gcttgggttt 1140
gcttctctgt cggagttgac tgatgattca agcttcttgt ga 1182

```

```

<210> 38
<211> 393
<212> PRT
<213> Arabidopsis thaliana

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<400> 38
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Met Ser Ser Arg Phe Ser Leu Thr Val Val Cys Leu Ile Ala Leu Leu
1          5          10          15

```

```

Pro Phe Val Val Gly Ile Arg Leu Ile Pro Ala Arg Ile Thr Ser Val
          20          25          30

```

```

Gly Asp Gly Gly Gly Gly Gly Gly Asn Asn Gly Phe Ser Lys Leu Gly
          35          40          45

```

```

Pro Phe Met Glu Ala Pro Glu Tyr Arg Asn Gly Lys Glu Cys Val Ser
          50          55          60

```

```

Ser Ser Val Asn Arg Glu Asn Phe Val Ser Ser Ser Ser Ser Asn
65          70          75          80

```

Asp	Pro	Ser	Leu	Val	His	Ile	Ala	Met	Thr	Leu	Asp	Ser	Glu	Tyr	Leu	85	90	95	
Arg	Gly	Ser	Ile	Ala	Ala	Val	His	Ser	Val	Leu	Arg	His	Ala	Ser	Cys	100	105	110	
Pro	Glu	Asn	Val	Phe	Phe	His	Phe	Ile	Ala	Ala	Glu	Phe	Asp	Ser	Ala	115	120	125	
Ser	Pro	Arg	Val	Leu	Ser	Gln	Leu	Val	Arg	Ser	Thr	Phe	Pro	Ser	Leu	130	135	140	
Asn	Phe	Lys	Val	Tyr	Ile	Phe	Arg	Glu	Asp	Thr	Val	Ile	Asn	Leu	Ile	145	150	155	160
Ser	Ser	Ser	Ile	Arg	Leu	Ala	Leu	Glu	Asn	Pro	Leu	Asn	Tyr	Ala	Arg	165	170	175	
Asn	Tyr	Leu	Gly	Asp	Ile	Leu	Asp	Arg	Ser	Val	Glu	Arg	Val	Ile	Tyr	180	185	190	
Leu	Asp	Ser	Asp	Val	Ile	Thr	Val	Asp	Asp	Ile	Thr	Lys	Leu	Trp	Asn	195	200	205	
Thr	Val	Leu	Thr	Gly	Ser	Arg	Val	Ile	Gly	Ala	Pro	Glu	Tyr	Cys	His	210	215	220	
Ala	Asn	Phe	Thr	Gln	Tyr	Phe	Thr	Ser	Gly	Phe	Trp	Ser	Asp	Pro	Ala	225	230	235	240
Leu	Pro	Gly	Leu	Ile	Ser	Gly	Gln	Lys	Pro	Cys	Tyr	Phe	Asn	Thr	Gly	245	250	255	
Val	Met	Val	Met	Asp	Leu	Val	Arg	Trp	Arg	Glu	Gly	Asn	Tyr	Arg	Glu	260	265	270	
Lys	Leu	Glu	Gln	Trp	Met	Gln	Leu	Gln	Lys	Lys	Met	Arg	Ile	Tyr	Asp	275	280	285	
Leu	Gly	Ser	Leu	Pro	Pro	Phe	Leu	Leu	Val	Phe	Ala	Gly	Asn	Val	Glu	290	295	300	
Ala	Ile	Asp	His	Arg	Trp	Asn	Gln	His	Gly	Leu	Gly	Gly	Asp	Asn	Ile	305	310	315	320

Arg Gly Ser Cys Arg Ser Leu His Pro Gly Pro Val Ser Leu Leu His
 325 330 335

Trp Ser Gly Lys Gly Lys Pro Trp Val Arg Leu Asp Glu Lys Arg Pro
 340 345 350

Cys Pro Leu Asp His Leu Trp Glu Pro Tyr Asp Leu Tyr Lys His Lys
 355 360 365

Ile Glu Arg Ala Lys Asp Gln Ser Leu Leu Gly Phe Ala Ser Leu Ser
 370 375 380

Glu Leu Thr Asp Asp Ser Ser Phe Leu
 385 390

<210> 39
 <211> 1173
 <212> DNA
 <213> Arabidopsis thaliana

<400> 39
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 accgtcggaa atggctttga tctggggtcg ttcgtggaag ctccggagta cagaaacggc 180
 aaggagtgcg tgtctcaatc gttgaacaga gaaaacttcg tgtcgtcttg cgacgcttcg 240
 ttagttcatg tagctatgac gcttgactcg gactacttac gtggctcaat cgcagccgta 300
 cattcaatgc tccgccacgc gtcgtgtcca gaaaacgtct tcttccatct catcgctgca 360
 gagtttgacc cggcgagtcc acgcgttctg agtcaactcg tccgatctac tttcccgctg 420
 ctaaacttca aagtctacat tttccgggaa gatacgggtga tcaaccttat ctcttcttca 480
 atcagacaag ctttagagaa tccattgaac tatgctcgga actacctcgg agatattctt 540
 gatccatgcg tagacagagt catttaccta gactcggaca tcatcgtcgt cgatgacata 600
 acaaagcttt ggaacacgag tttgacaggg tcaagaatca tcggagctcc ggagtattgt 660
 cagcctaact tcacaaagta cttcaacttca ggtttctggt ccgacccggc tttaccgggt 720
 ttcttctcgg gtcgaaagcc ttgttatttc aacacgggtg tgatggtgat ggatctagtt 780
 agatggagag aaggaaacta cagagaaaag cttgaaactt ggatgcagat acagaagaag 840
 aagagaatct acgatttggg ttctttgcct ccgtttcttc ttgtcttcgc agggaaacgtt 900
 gaagcaattg atcataggtg gaaccaacat ggtttaggag gagacaatgt acgaggaagt 960
 tgtaggtctt tgcataaagg accagtgagt ttgttgcatg ggagtggtaa aggtaagcca 1020
 tgggtgagac ttgatgagaa gagaccgtgt ccgttggtatc atttatggga accgtatgat 1080

ttatatgagc ataagattga aagagctaaa gatcagtcctt tggtcggggtt ctcttcctttg 1140
tctgagttaa cagaagattc aagcttttttc tga 1173

<210> 40
<211> 390
<212> PRT
<213> Arabidopsis thaliana

<400> 40

Met Arg Leu Arg Phe Pro Met Lys Ser Ala Val Leu Ala Phe Ala Ile
1 5 10 15

Phe Leu Val Phe Ile Pro Leu Phe Ser Val Gly Ile Arg Met Ile Pro
20 25 30

Gly Arg Leu Thr Ala Val Ser Ala Thr Val Gly Asn Gly Phe Asp Leu
35 40 45

Gly Ser Phe Val Glu Ala Pro Glu Tyr Arg Asn Gly Lys Glu Cys Val
50 55 60

Ser Gln Ser Leu Asn Arg Glu Asn Phe Val Ser Ser Cys Asp Ala Ser
65 70 75 80

Leu Val His Val Ala Met Thr Leu Asp Ser Glu Tyr Leu Arg Gly Ser
85 90 95

Ile Ala Ala Val His Ser Met Leu Arg His Ala Ser Cys Pro Glu Asn
100 105 110

Val Phe Phe His Leu Ile Ala Ala Glu Phe Asp Pro Ala Ser Pro Arg
115 120 125

Val Leu Ser Gln Leu Val Arg Ser Thr Phe Pro Ser Leu Asn Phe Lys
130 135 140

Val Tyr Ile Phe Arg Glu Asp Thr Val Ile Asn Leu Ile Ser Ser Ser
145 150 155 160

Ile Arg Gln Ala Leu Glu Asn Pro Leu Asn Tyr Ala Arg Asn Tyr Leu
165 170 175

Gly Asp Ile Leu Asp Pro Cys Val Asp Arg Val Ile Tyr Leu Asp Ser
180 185 190

Asp Ile Ile Val Val Asp Asp Ile Thr Lys Leu Trp Asn Thr Ser Leu
 195 200 205

Thr Gly Ser Arg Ile Ile Gly Ala Pro Glu Tyr Cys His Ala Asn Phe
 210 215 220

Thr Lys Tyr Phe Thr Ser Gly Phe Trp Ser Asp Pro Ala Leu Pro Gly
 225 230 235 240

Phe Phe Ser Gly Arg Lys Pro Cys Tyr Phe Asn Thr Gly Val Met Val
 245 250 255

Met Asp Leu Val Arg Trp Arg Glu Gly Asn Tyr Arg Glu Lys Leu Glu
 260 265 270

Thr Trp Met Gln Ile Gln Lys Lys Lys Arg Ile Tyr Asp Leu Gly Ser
 275 280 285

Leu Pro Pro Phe Leu Leu Val Phe Ala Gly Asn Val Glu Ala Ile Asp
 290 295 300

His Arg Trp Asn Gln His Gly Leu Gly Gly Asp Asn Val Arg Gly Ser
 305 310 315 320

Cys Arg Ser Leu His Lys Gly Pro Val Ser Leu Leu His Trp Ser Gly
 325 330 335

Lys Gly Lys Pro Trp Val Arg Leu Asp Glu Lys Arg Pro Cys Pro Leu
 340 345 350

Asp His Leu Trp Glu Pro Tyr Asp Leu Tyr Glu His Lys Ile Glu Arg
 355 360 365

Ala Lys Asp Gln Ser Leu Phe Gly Phe Ser Ser Leu Ser Glu Leu Thr
 370 375 380

Glu Asp Ser Ser Phe Phe
 385 390

<210> 41
 <211> 1056
 <212> DNA
 <213> Arabidopsis thaliana

<400> 41
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ccaactcttc ctgttttcag agaagccccg gcttttcgaa acggtgatca atgcgggact 180
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atggctgccg ttttgtctct ccttcaacat tccacttgcc ctgaaaacct ctcttttcat 300
ttcctgtccc ttcctcattt cgaaaacgac cttttcacca gcatcaaate aacctttcct 360
tacctaaact tcaagattta tcagtttgat ccaaacctcg tccgcagcaa gatatcgaaa 420
tccatcaggc aagcccttga tcagcctctt aactacgcaa gaatctacct cgcggatatc 480
atccctagca gcgttgacag gatcatctac ttagactcag acctcgttgt ggtagacgac 540
atagagaagc tgtggcatgt ggagatggaa ggtaaagtgg tggctgctcc cgagtactgc 600
cacgcaaact tcaccatta tttcacaaga actttctggt cagaccgggt attggtcaaa 660
gttcttgaag gaaaacgtcc gtgttatttc aacacagggg tgatggttgt ggatgtaaac 720
aaatggagga aaggaatgta tacacagaag gtagaagagt ggatgacaat tcagaagcag 780
aagaggatat accatttggg atcattacct ccgtttctgc tgatattcgc cggatgata 840
aaagcggta atcatagggt gaaccagcat ggtctaggag gtgataattt cgaaggaaga 900
tgtagaacgt tgcattccgg accgataagt cttcttctact ggagtggaaa agggaagcca 960
tggttaagac tagattcaag gaagccttgt atcgttgatc atctatgggc accgtatgat 1020
ctgtaccgtt catcaagaca ttcattagaa gagtag 1056

```

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<210> 42
<211> 351
<212> PRT
<213> Arabidopsis thaliana

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<400> 42

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```

Met Ala Ser Arg Ser Leu Ser Tyr Thr Gln Leu Leu Gly Leu Leu Ser
1          5          10          15

```

```

Phe Ile Leu Leu Leu Val Thr Thr Thr Thr Met Ala Val Arg Val Gly
          20          25          30

```

```

Val Ile Leu His Lys Pro Ser Ala Pro Thr Leu Pro Val Phe Arg Glu
          35          40          45

```

```

Ala Pro Ala Phe Arg Asn Gly Asp Gln Cys Gly Thr Arg Glu Ala Asp
          50          55          60

```

```

Gln Ile His Ile Ala Met Thr Leu Asp Thr Asn Tyr Leu Arg Gly Thr
65          70          75          80

```

```

Met Ala Ala Val Leu Ser Leu Leu Gln His Ser Thr Cys Pro Glu Asn

```

85							90					95						
Leu	Ser	Phe	His	Phe	Leu	Ser	Leu	Pro	His	Phe	Glu	Asn	Asp	Leu	Phe			
			100					105					110					
Thr	Ser	Ile	Lys	Ser	Thr	Phe	Pro	Tyr	Leu	Asn	Phe	Lys	Ile	Tyr	Gln			
		115					120					125						
Phe	Asp	Pro	Asn	Leu	Val	Arg	Ser	Lys	Ile	Ser	Lys	Ser	Ile	Arg	Gln			
	130					135					140							
Ala	Leu	Asp	Gln	Pro	Leu	Asn	Tyr	Ala	Arg	Ile	Tyr	Leu	Ala	Asp	Ile			
145					150					155					160			
Ile	Pro	Ser	Ser	Val	Asp	Arg	Ile	Ile	Tyr	Leu	Asp	Ser	Asp	Leu	Val			
				165					170					175				
Val	Val	Asp	Asp	Ile	Glu	Lys	Leu	Trp	His	Val	Glu	Met	Glu	Gly	Lys			
			180					185					190					
Val	Val	Ala	Ala	Pro	Glu	Tyr	Cys	His	Ala	Asn	Phe	Thr	His	Tyr	Phe			
		195					200					205						
Thr	Arg	Thr	Phe	Trp	Ser	Asp	Pro	Val	Leu	Val	Lys	Val	Leu	Glu	Gly			
	210					215					220							
Lys	Arg	Pro	Cys	Tyr	Phe	Asn	Thr	Gly	Val	Met	Val	Val	Asp	Val	Asn			
225					230					235					240			
Lys	Trp	Arg	Lys	Gly	Met	Tyr	Thr	Gln	Lys	Val	Glu	Glu	Trp	Met	Thr			
			245						250					255				
Ile	Gln	Lys	Gln	Lys	Arg	Ile	Tyr	His	Leu	Gly	Ser	Leu	Pro	Pro	Phe			
			260					265					270					
Leu	Leu	Ile	Phe	Ala	Gly	Asp	Ile	Lys	Ala	Val	Asn	His	Arg	Trp	Asn			
		275					280					285						
Gln	His	Gly	Leu	Gly	Gly	Asp	Asn	Phe	Glu	Gly	Arg	Cys	Arg	Thr	Leu			
	290					295					300							
His	Pro	Gly	Pro	Ile	Ser	Leu	Leu	His	Trp	Ser	Gly	Lys	Gly	Lys	Pro			
305					310					315					320			
Trp	Leu	Arg	Leu	Asp	Ser	Arg	Lys	Pro	Cys	Ile	Val	Asp	His	Leu	Trp			
			325					330						335				

Ala Pro Tyr Asp Leu Tyr Arg Ser Ser Arg His Ser Leu Glu Glu
340 345 350

<210> 43
<211> 1098
<212> DNA
<213> Arabidopsis thaliana

<400> 43
atgatgtctg gttcaagatt agcctctaga ctaataataa tcttctcaat aatctccaca 60
tctttcttca ccgttgaatc gattcgacta ttccctgatt cattcgacga tgcattcttca 120
gatttaaatgg aagctccagc atatcaaaac ggtcttgatt gctctgtttt agccaaaaac 180
agactcttgt tagcttgtga tccatcagct gttcatatag ctatgactct agatccagct 240
tacttgctg gcacggatc tgcagtacat tccatcctca aacacacttc ttgccctgaa 300
aacatcttct tccacttcat tgcttcgggt acaagtcagg gttccctcgc caagacccta 360
tcctctgttt ttccttcttt gagtttcaaa gtctatacct ttgaagaaac cacgggtcaag 420
aatctaactc cttcttctat aagacaagct cttgatagtc ctttgaatta cgcaagaagc 480
tacttatccg agattctttc ttcgtgtgtt agtcgagtga tttatctcga ttcggatgtg 540
attgtggtcg atgatattca gaaactatgg aagatttctt tatccgggtc aagaacaatc 600
ggtgcaccag agtattgcc acaaatttc accaaatact tcacagatag tttctggtcc 660
gatcaaaaac tctcgagtgt cttcgattcc aagactcctt gttatttcaa cacaggagtg 720
atggttatcg atttagagcg atggagagaa ggagattaca cgagaaagat cgaaaactgg 780
atgaagattc agaaagaaga taagagaatc tacgaattgg gttctttacc accgtttctt 840
ctagtgtttg gtggtgatat tgaagctatt gatcatcaat ggaaccaaca cgggtctcgg 900
ggagacaaca ttgtgagtag ttgtagatct ttgcatcctg gtccgggttag tttgatacat 960
tggagtggta aagggaagcc atgggtagg cttgatgatg gtaagccttg tccaattgat 1020
tatctttggg ctcttatga tcttcacaag tcacagaggc agtatcttca atacaatcaa 1080
gagttagaaa ttctttga 1098

<210> 44
<211> 365
<212> PRT
<213> Arabidopsis thaliana

<400> 44

Met Met Ser Gly Ser Arg Leu Ala Ser Arg Leu Ile Ile Ile Phe Ser
1 5 10 15

Ile Ile Ser Thr Ser Phe Phe Thr Val Glu Ser Ile Arg Leu Phe Pro
 20 25 30

Asp Ser Phe Asp Asp Ala Ser Ser Asp Leu Met Glu Ala Pro Ala Tyr
 35 40 45

Gln Asn Gly Leu Asp Cys Ser Val Leu Ala Lys Asn Arg Leu Leu Leu
 50 55 60

Ala Cys Asp Pro Ser Ala Val His Ile Ala Met Thr Leu Asp Pro Ala
 65 70 75 80

Tyr Leu Arg Gly Thr Val Ser Ala Val His Ser Ile Leu Lys His Thr
 85 90 95

Ser Cys Pro Glu Asn Ile Phe Phe His Phe Ile Ala Ser Gly Thr Ser
 100 105 110

Gln Gly Ser Leu Ala Lys Thr Leu Ser Ser Val Phe Pro Ser Leu Ser
 115 120 125

Phe Lys Val Tyr Thr Phe Glu Glu Thr Thr Val Lys Asn Leu Ile Ser
 130 135 140

Ser Ser Ile Arg Gln Ala Leu Asp Ser Pro Leu Asn Tyr Ala Arg Ser
 145 150 155 160

Tyr Leu Ser Glu Ile Leu Ser Ser Cys Val Ser Arg Val Ile Tyr Leu
 165 170 175

Asp Ser Asp Val Ile Val Val Asp Asp Ile Gln Lys Leu Trp Lys Ile
 180 185 190

Ser Leu Ser Gly Ser Arg Thr Ile Gly Ala Pro Glu Tyr Cys His Ala
 195 200 205

Asn Phe Thr Lys Tyr Phe Thr Asp Ser Phe Trp Ser Asp Gln Lys Leu
 210 215 220

Ser Ser Val Phe Asp Ser Lys Thr Pro Cys Tyr Phe Asn Thr Gly Val
 225 230 235 240

Met Val Ile Asp Leu Glu Arg Trp Arg Glu Gly Asp Tyr Thr Arg Lys
 245 250 255

Ile Glu Asn Trp Met Lys Ile Gln Lys Glu Asp Lys Arg Ile Tyr Glu
260 265 270

Leu Gly Ser Leu Pro Pro Phe Leu Leu Val Phe Gly Gly Asp Ile Glu
275 280 285

Ala Ile Asp His Gln Trp Asn Gln His Gly Leu Gly Gly Asp Asn Ile
290 295 300

Val Ser Ser Cys Arg Ser Leu His Pro Gly Pro Val Ser Leu Ile His
305 310 315 320

Trp Ser Gly Lys Gly Lys Pro Trp Val Arg Leu Asp Asp Gly Lys Pro
325 330 335

Cys Pro Ile Asp Tyr Leu Trp Ala Pro Tyr Asp Leu His Lys Ser Gln
340 345 350

Arg Gln Tyr Leu Gln Tyr Asn Gln Glu Leu Glu Ile Leu
355 360 365

<210> 45
<211> 1026
<212> DNA
<213> Arabidopsis thaliana

<400> 45
atgcactcga agtttatatt atatctcagc atcctcgccg tattcacctg ctctttcgcc 60
ggcggcgaga gattcaaaga agctccaaag ttcttcaact ccccgagtg tctaaccatc 120
gaaaacgatg aagatttcgt ttgttcagac aaagccatcc acgtggcaat gaccttagac 180
acagcttacc tccgtggctc aatggccgtg attctctccg tcttccaaca ctcttcttgt 240
cctcaaaaca ttgttttcca ctctgctact tcaaaacaaa gccaccgact ccaaaactac 300
gtcgttgctt cttttcccta cttgaaattc cgaatttacc cttacgacgt agccgccatc 360
tccggcctca tctcaacctc catccgctcc gcgctagact ctccgctaaa ctacgcaaga 420
aactacctcg ccgacattct tcccacgtgc ctctcacgtg tcgtatacct agactcagat 480
ctcatactcg tcgatgacat ctccaagctc ttctccactc acatccctac cgacgtcgtt 540
ttagccgcgc ctgagtactg caacgcaaac ttcacgactt actttactcc gacgttttgg 600
tcaaaccctt ctctctccat cacactatcc ctcaaccgcc gtgctacacc gtgttacttc 660
aacaccggag tgatgggcat cgaggttaaag aaatggcgag aaggagatta cacgaggaag 720
atcatagagt ggatggagtt acaaaaacgg ataagaatct acgagttagg ctctttacca 780
ccgtttttac ttgtcttcgc cggaaacata gtcgggtg atcaccggtg gaaccaacac 840

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ttgttgcatg ggagtgggaa aggggaagcca tgggtaaggt tagatgatgg tcgaccttgc      960
ccgcttgatg cactttgggt tccatatgat ttgtagaggt cacgggtcga ccttatcgag      1020
agttaa                                                                    1026

```

```

<210> 46
<211> 341
<212> PRT
<213> Arabidopsis thaliana

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<400> 46

```

```

Met His Ser Lys Phe Ile Leu Tyr Leu Ser Ile Leu Ala Val Phe Thr
1          5          10          15

```

```

Val Ser Phe Ala Gly Gly Glu Arg Phe Lys Glu Ala Pro Lys Phe Phe
          20          25          30

```

```

Asn Ser Pro Glu Cys Leu Thr Ile Glu Asn Asp Glu Asp Phe Val Cys
          35          40          45

```

```

Ser Asp Lys Ala Ile His Val Ala Met Thr Leu Asp Thr Ala Tyr Leu
          50          55          60

```

```

Arg Gly Ser Met Ala Val Ile Leu Ser Val Leu Gln His Ser Ser Cys
65          70          75          80

```

```

Pro Gln Asn Ile Val Phe His Phe Val Thr Ser Lys Gln Ser His Arg
          85          90          95

```

```

Leu Gln Asn Tyr Val Val Ala Ser Phe Pro Tyr Leu Lys Phe Arg Ile
          100          105          110

```

```

Tyr Pro Tyr Asp Val Ala Ala Ile Ser Gly Leu Ile Ser Thr Ser Ile
          115          120          125

```

```

Arg Ser Ala Leu Asp Ser Pro Leu Asn Tyr Ala Arg Asn Tyr Leu Ala
          130          135          140

```

```

Asp Ile Leu Pro Thr Cys Leu Ser Arg Val Val Tyr Leu Asp Ser Asp
          145          150          155          160

```

```

Leu Ile Leu Val Asp Asp Ile Ser Lys Leu Phe Ser Thr His Ile Pro
          165          170          175

```

```

Thr Asp Val Val Leu Ala Ala Pro Glu Tyr Cys Asn Ala Asn Phe Thr

```


180	185	190
Thr Tyr Phe Thr Pro Thr Phe Trp Ser Asn Pro Ser Leu Ser Ile Thr		
195	200	205
Leu Ser Leu Asn Arg Arg Ala Thr Pro Cys Tyr Phe Asn Thr Gly Val		
210	215	220
Met Val Ile Glu Leu Lys Lys Trp Arg Glu Gly Asp Tyr Thr Arg Lys		
225	230	235
Ile Ile Glu Trp Met Glu Leu Gln Lys Arg Ile Arg Ile Tyr Glu Leu		
245	250	255
Gly Ser Leu Pro Pro Phe Leu Leu Val Phe Ala Gly Asn Ile Ala Pro		
260	265	270
Val Asp His Arg Trp Asn Gln His Gly Leu Gly Gly Asp Asn Phe Arg		
275	280	285
Gly Leu Cys Arg Asp Leu His Pro Gly Pro Val Ser Leu Leu His Trp		
290	295	300
Ser Gly Lys Gly Lys Pro Trp Val Arg Leu Asp Asp Gly Arg Pro Cys		
305	310	315
Pro Leu Asp Ala Leu Trp Val Pro Tyr Asp Leu Leu Glu Ser Arg Phe		
325	330	335
Asp Leu Ile Glu Ser		
340		

<210> 47
 <211> 1086
 <212> DNA
 <213> Arabidopsis thaliana

<400> 47	
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tacctccggt tcccctctctc cgatccaccg ccgcatagat tctccttcag aaaagctcct	180
gttttccgca atgccgccga ttgcgccgcc gcagatatcg attccggcgt ctgtaaccct	240
tccttggtcc acgtcgcgat tactctcgat ttcgagtacc tgcgtggctc aatcgccgcc	300
gttcattcga ttctcaagca ctcgctcgtgt cccgagagcg tcttcttcca tttctcgtc	360

tccgagactg acctagaatc cttgattcgt tcgacttttc ccgaattgaa attaaagggtt 420
tactactttcg atccggagat tgtacggacg ctgatctcaa cctccgtgag acaagcgctc 480
gagcagccgt tgaattacgc tagaaattac ctagctgacc ttctcgagcc ttgcgtgcgt 540
cgcgatgatct acctagattc cgatctaata gtcgctgacg acatcgcaaa gctctggatg 600
acgaaaactgg gatcgaaaac gatcggagct cccgagtact gtcacgcaa cttcaciaag 660
tatttcacac cggcgttctg gtccgacgag aggttctccg gagctttctc cgggaggaaa 720
ccgtgctact tcaacacggg agtgatggtg atggatctag agagatggag gcgcgtaggg 780
tacacggagg tgatagagaa atggatggag attcagaaga gtgataggat ttacgagctg 840
ggatcattgc cgccgttctt gttggtgttc gccggagaag tagctccgat agagcatcgg 900
tggaaccagc atgggcttgg tggagataac gtgagaggaa gctgtagaga ttacatccc 960
ggtccggtta gcttgcttca ttgggtccgt agtggtaaac cgtggtttcg gttagattcg 1020
agacggcctt gtccacttga tactcttttg gcaccttatg atttgtatgg acactactct 1080
cgctga 1086

<210> 48
<211> 361
<212> PRT
<213> Arabidopsis thaliana
<400> 48

Met Leu Trp Ile Met Arg Phe Ser Gly Leu Phe Ser Ala Ala Leu Val
1 5 10 15

Ile Ile Val Leu Ser Pro Ser Leu Gln Ser Phe Pro Pro Ala Glu Ala
20 25 30

Ile Arg Ser Ser His Leu Asp Ala Tyr Leu Arg Phe Pro Ser Ser Asp
35 40 45

Pro Pro Pro His Arg Phe Ser Phe Arg Lys Ala Pro Val Phe Arg Asn
50 55 60

Ala Ala Asp Cys Ala Ala Ala Asp Ile Asp Ser Gly Val Cys Asn Pro
65 70 75 80

Ser Leu Val His Val Ala Ile Thr Leu Asp Phe Glu Tyr Leu Arg Gly
85 90 95

Ser Ile Ala Ala Val His Ser Ile Leu Lys His Ser Ser Cys Pro Glu
100 105 110

Ser Val Phe Phe His Phe Leu Val Ser Glu Thr Asp Leu Glu Ser Leu
 115 120 125

Ile Arg Ser Thr Phe Pro Glu Leu Lys Leu Lys Val Tyr Tyr Phe Asp
 130 135 140

Pro Glu Ile Val Arg Thr Leu Ile Ser Thr Ser Val Arg Gln Ala Leu
 145 150 155 160

Glu Gln Pro Leu Asn Tyr Ala Arg Asn Tyr Leu Ala Asp Leu Leu Glu
 165 170 175

Pro Cys Val Arg Arg Val Ile Tyr Leu Asp Ser Asp Leu Ile Val Val
 180 185 190

Asp Asp Ile Ala Lys Leu Trp Met Thr Lys Leu Gly Ser Lys Thr Ile
 195 200 205

Gly Ala Pro Glu Tyr Cys His Ala Asn Phe Thr Lys Tyr Phe Thr Pro
 210 215 220

Ala Phe Trp Ser Asp Glu Arg Phe Ser Gly Ala Phe Ser Gly Arg Lys
 225 230 235 240

Pro Cys Tyr Phe Asn Thr Gly Val Met Val Met Asp Leu Glu Arg Trp
 245 250 255

Arg Arg Val Gly Tyr Thr Glu Val Ile Glu Lys Trp Met Glu Ile Gln
 260 265 270

Lys Ser Asp Arg Ile Tyr Glu Leu Gly Ser Leu Pro Pro Phe Leu Leu
 275 280 285

Val Phe Ala Gly Glu Val Ala Pro Ile Glu His Arg Trp Asn Gln His
 290 295 300

Gly Leu Gly Gly Asp Asn Val Arg Gly Ser Cys Arg Asp Leu His Pro
 305 310 315 320

Gly Pro Val Ser Leu Leu His Trp Ser Gly Ser Gly Lys Pro Trp Phe
 325 330 335

Arg Leu Asp Ser Arg Arg Pro Cys Pro Leu Asp Thr Leu Trp Ala Pro
 340 345 350

Tyr Asp Leu Tyr Gly His Tyr Ser Arg
 355 360

<210> 49
 <211> 1041
 <212> DNA
 <213> Arabidopsis thaliana

<400> 49
 atgcttttga taacgagatt tgctggatta ttctccgccg cgatggcagt gatcgtgtta 60
 tctccgtcgc ttcagtcatt tctccggcg gcggaatcc gttcttctcc atcaccgate 120
 ttcagaaaag ctccagcggg gttcaacaac ggcgacgaat gtctctcctc cggcggcgtc 180
 tgcaatccgt cgttggtcca cgtggcgatc acgtagacg tagagtacct gcgtggctca 240
 atcgcagccg ttaactcgat cttcagcac tcggtgtgtc cagagagcgt cttcttccac 300
 ttcacgccc tctccgagga acaaacctg ttggagtcgc tggtagatc ggttttcccg 360
 agactgaaat tcaatattta cgattttgcc cctgagacag ttcgtgggtt gatttcttct 420
 tccgtgagac aagctctcga gcagcctctg aactacgcta gaagctactt agcggatctg 480
 ctggagcctt gtgttaaccg tgtcatatac ttggattcgg atcttgtcgt cgtcgatgac 540
 atcgctaagc tttgaaaac tagcctaggc tcgaggataa tcggagctcc ggagtattgt 600
 cacgcgaatt tcacgaaata cttcacgga ggattctggt cggaggagag attctccggt 660
 acctttagag ggaggaagcc atgttacttc aacacaggtg tgatggtgat agatcttaag 720
 aaatggagaa gaggtggtta cacgaaacgt atcgagaaat ggatggagat tcagagaaga 780
 gagaggattt acgaactagg ctcgcttcca ccgtttcttc tagttttctc cggtcacgtg 840
 gctcccatct ctcaccggtg gaaccagcat ggacttggtg gtgacaatgt tagaggtagc 900
 tgtcgtgatt tgcacctctg tctgtgagt ttgctgcatt ggtctggtag tggcaagccc 960
 tggataagac tcgattccaa acggccttgt cccttagacg cattatggac gccttacgac 1020
 ttgtatcgac attcgattg a 1041

<210> 50
 <211> 346
 <212> PRT
 <213> Arabidopsis thaliana

<400> 50

Met Leu Trp Ile Thr Arg Phe Ala Gly Leu Phe Ser Ala Ala Met Ala
 1 5 10 15

Val Ile Val Leu Ser Pro Ser Leu Gln Ser Phe Pro Pro Ala Ala Ala
 20 25 30

Ile Arg Ser Ser Pro Ser Pro Ile Phe Arg Lys Ala Pro Ala Val Phe
 35 40 45

Asn Asn Gly Asp Glu Cys Leu Ser Ser Gly Gly Val Cys Asn Pro Ser
 50 55 60

Leu Val His Val Ala Ile Thr Leu Asp Val Glu Tyr Leu Arg Gly Ser
 65 70 75 80

Ile Ala Ala Val Asn Ser Ile Leu Gln His Ser Val Cys Pro Glu Ser
 85 90 95

Val Phe Phe His Phe Ile Ala Val Ser Glu Glu Thr Asn Leu Leu Glu
 100 105 110

Ser Leu Val Arg Ser Val Phe Pro Arg Leu Lys Phe Asn Ile Tyr Asp
 115 120 125

Phe Ala Pro Glu Thr Val Arg Gly Leu Ile Ser Ser Ser Val Arg Gln
 130 135 140

Ala Leu Glu Gln Pro Leu Asn Tyr Ala Arg Ser Tyr Leu Ala Asp Leu
 145 150 155 160

Leu Glu Pro Cys Val Asn Arg Val Ile Tyr Leu Asp Ser Asp Leu Val
 165 170 175

Val Val Asp Asp Ile Ala Lys Leu Trp Lys Thr Ser Leu Gly Ser Arg
 180 185 190

Ile Ile Gly Ala Pro Glu Tyr Cys His Ala Asn Phe Thr Lys Tyr Phe
 195 200 205

Thr Gly Gly Phe Trp Ser Glu Glu Arg Phe Ser Gly Thr Phe Arg Gly
 210 215 220

Arg Lys Pro Cys Tyr Phe Asn Thr Gly Val Met Val Ile Asp Leu Lys
 225 230 235 240

Lys Trp Arg Arg Gly Gly Tyr Thr Lys Arg Ile Glu Lys Trp Met Glu
 245 250 255

Ile Gln Arg Arg Glu Arg Ile Tyr Glu Leu Gly Ser Leu Pro Pro Phe
 260 265 270

Leu Leu Val Phe Ser Gly His Val Ala Pro Ile Ser His Arg Trp Asn
 275 280 285

Gln His Gly Leu Gly Gly Asp Asn Val Arg Gly Ser Cys Arg Asp Leu
 290 295 300

His Pro Gly Pro Val Ser Leu Leu His Trp Ser Gly Ser Gly Lys Pro
 305 310 315 320

Trp Ile Arg Leu Asp Ser Lys Arg Pro Cys Pro Leu Asp Ala Leu Trp
 325 330 335

Thr Pro Tyr Asp Leu Tyr Arg His Ser His
 340 345